THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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NOW READY.

THE

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(J. A. BERLY'S).

1909 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

CHARGING FOR ELECTRICITY.

THE advent of the metallic-filament lamp, which, as we have already stated, we consider to be a boon to the electrical industry, does not appear to be appreciated as it should be by some of the electrical engineers in charge of supply undertakings.

At the recent general meeting of the Metropolitan Electric Supply Co., Ltd.,* the chairman alluded to the subject, and said that "they were in hopes that the introduction of that lamp would mean increased demand for current"; and he proved that this was already apparent by his previous remark with reference to users of the new lamps, that "they found that a great number of their customers did not cut down their expenditure, but rather increased the lighting on their premises." But instead of welcoming the new-comer with open arms, he added that "He thought that, if the introduction of the lamp should mean that the price of electricity should become too low, the companies would have to consider the question whether, directly or indirectly, the price should not be raised. He hoped, however, that that would never be the case."

Any such course on the part of the supply companies would, in our opinion, be most unwise. As vendors of electrical energy, the only legitimate questions they have to consider are those of cost of production and delivery, on the one hand, and, on the other, the price to be charged, so as to leave as large a margin for profit as the consumer finds it in his interest to pay.

The matter primarily affects only one section of the industry—viz., that of lighting—and it is clear that, so far as the producer is concerned, although the growth of the present business may be temporarily checked, there is no addition to the cost of the article supplied, and therefore no reason for adding to the price charged.

The proper and legitimate course of action is to encourage the existing users of the electric light to adopt more of it, and to secure new consumers through the additional advantages offered by the high-efficiency lamps. As a matter of fact, these results are already becoming apparent, as we find from the evidence before us that, although the saving in energy by the use of the metallic-filament lamp is, light for light, fully two-thirds the actual reduction in the amount of the quarterly bills is much less, and in some cases none at all, owing to the increased light taken as a consequence of the greater economy. The improvement in the light without additional cost creates great satisfaction among the users, and the loss of revenue by the adoption of the new lamp is found not to exceed about 25 per cent., owing to the consumer using more light.

The gas companies appear to be fully alive to the importance of this new factor in electric lighting, and add to the unblushing statements, so long familiar to us, with reference

* ELECTRICAL REVIEW, March 12th, 1909, page 443.

to the relative cost of electricity and gas, that "despite the 70 per cent. saving now possible with electricity, gas is still cheaper, and far cheaper for the ordinary consumer." This statement was made a few days ago by the Chief Inspector of the Gas Light and Coke Co., who suggested "that the two illuminants should be pitted one against the other in some immediate and convincing test."

We should be delighted to have such a test made under the auspices of some thoroughly independent authority, who might investigate not only the actual relative running costs of the two sources of illumination, but also the equally important questions of the effect of each system upon health; cleanliness; injury to stock-in-trade, furniture, books, picture-frames, &c.; safety from accidents by fire; and the best diffusion of light.

The evidence before us upon all these questions is of two kinds—viz., the testimony of users from their actual experience, and the statements made without such verification. Let us analyse specimens of both these classes of evidence.

The Croydon Gas Co. have issued a card bearing the following comparisons of the cost of gas and electricity, the results printed in scarlet ink—an appropriate colour, for the writer was probably blushing when he penned it!

Comparative Cost of Gas and Electric Lighting in Croydon (Per 1,000 Hours).

Gas.		Electricity.	
One Bijou inverted burner.		Three 8-c.p. lamps.	
1,000 hours at 1½ cb. ft. = 1,500 cb. ft. at 2s. 8d.	4 0	1,000 hours at 96 watts = 96 units at 4½d. ...	1 16 0
Renewals, 4 mantles at 5d.	1 8	Renewals, 3 lamps at 1s.	3 0
24 c.p. costs ...	5 8	24 c.p. costs	£1 19 0
One large inverted burner.		Two Osram lamps.	
1,000 hours at 4 cb. ft. = 4,000 cb. ft. at 2s. 8d.	10 8	1,000 hours at 70 watts = 70 units at 4½d. ...	1 6 3
Renewals, 4 mantles at 6d.	2 0	Renewals, 2 lamps at 4s.	8 0
60 c.p. costs ...	12 8	60 c.p. costs	£1 14 3

This statement requires very important corrections. We understand that the price of gas in Croydon is 2s. 10d. per 1,000 cb. ft., and the average cost of electricity under the maximum demand system is 4d.; but the serious error is in the alleged candle-power and life of the lamps which are compared.

The inverted gas mantle under actual working conditions, if renewed every six weeks, will not give a mean candle-power of over 20 c.p., and the cost works out for 1,000 hours as follows:—

$$\frac{1{,}000 \times 20}{32 \times 4} = 156 \text{ c.p.-hours for 1d.}$$

The metal-filament 35-watt lamp gives 30 c.p., and working out similar calculations:—

$$\frac{1{,}000 \times 30}{4{\cdot}5 \times 35} = 190 \text{ c.p.-hours for 1d.}$$

Thus, the electric lamp is cheaper under any circumstances, and unless the gas mantle is renewed every six weeks, gas lighting becomes much more expensive than electric.

The life of the inverted gas burner is alleged to be 250 hours. The candle-power of the Osram lamp continues practically the same throughout its life of 2,000 hours, but it is notorious that the gas mantle rapidly deteriorates.

These are points which must be taken into account in arriving at the relative cost, but the best, in fact, the only satisfactory, evidence as to the relative cost of electricity and gas is to be found in the testimony of consumers themselves who have tried both systems, and are able to speak definitely after comparing their bills for corresponding quarters.

Abundant evidence of this kind has been published from time to time by the suppliers of electricity, and we select and print on a later page a few samples, which prove that in actual practice the cost has always been against gas; and when the indirect economies and advantages are taken into account, the gain has been so great as to fully account for the growth of the business, even before the introduction of the metallic-filament lamps, which have so materially reduced the cost to the consumers.

THE FAIR WAGES CLAUSE.

The recommendations of the Departmental Committee on the Fair Wages Clause in Government Contracts, on which we commented in our issue of January 8th, were recently the subject of discussion in the House of Commons, when one of the members of the Labour Party moved a resolution to the effect that the clause should be so amended as to provide that the contractor shall, under penalty, pay to all the workmen in his employ not less than the minimum standard rate recognised by trade societies in the district, and shall observe the recognised hours and proper conditions of labour; and that in districts where there are no such recognised rates and conditions, the rates and conditions recognised by trade societies in the nearest district shall be enforced. The resolution also proposed to prohibit sub-letting, except where the department concerned specially allows the sub-letting of such special portions of the work as could not be produced by the contractor in the ordinary course of his business, and to make all sub-contractors subject to the same conditions as the contractor.

This resolution embodies several of the most important claims advanced by the representatives of the Trade Unions before the Departmental Committee; and it will be remembered that the Committee, after carefully considering the evidence tendered by all parties, recommended that the original wording of the clause should be retained, and that no alteration should be made with a view to enforcing the observance of Trade Union rates and conditions. Although the resolution met with no better fate in the House of Commons, as regards the attempt to make the Trade Societies the sole arbiters of what were fair wages and conditions, yet it led to the adoption of an amendment proposed by Mr. Buxton, who was the principal speaker on behalf of the Government; and this amendment is of such importance, as expressing the intentions of the Government, that we think it advisable to quote it in full. The amendment provides that "the contractor shall, under the penalty of a fine or otherwise, pay rates of wages and observe hours of labour not less favourable than those commonly recognised by employers and Trade Societies (or, in the absence of such recognised wages and hours, those which in practice prevail

amongst good employers) in the trade in the district where the work is carried out. Where there are no such wages and hours recognised or prevailing in the district, those recognised or prevailing in the nearest district in which the general industrial circumstances are similar shall be adopted. Further, the conditions of employment generally accepted in the district in the trade concerned shall be taken into account in considering how far the terms of the fair wages clauses are being observed. The contractor shall be prohibited from transferring or assigning, directly or indirectly, to any person or persons whatever, any portion of his contract without the written permission of the department. Sub-letting, other than that which may be customary in the trade concerned, shall be prohibited. The contractor shall be responsible for the observance of the fair wages clauses by the sub-contractor."

The amendment differs from the original motion in several very important points, viz., that the rate of wages and conditions of labour are to be those recognised by employers and Trade Societies, instead of those recognised by Trade Societies only; that where there are no such recognised rates and conditions, those prevailing in the nearest district in which the general industrial circumstances are similar are to be adopted, instead of those recognised by the Trade Societies in the nearest district, in which it might well happen that the industrial circumstances were very different; that the words "to all the workmen in his employ" are left out in the amendment; and that the restrictions on sub-letting are not quite so severe.

We gather from the report of Mr. Buxton's speech in the *Times*, that he claimed that they were all agreed as to the principle; but we do not feel assured that the Trade Unionists will agree with this, as the principle for which the Unions are fighting appears to be that they shall get Government recognition of their claim to settle the rates of wages and conditions of labour, not only for Government contracts, but for all work executed by contractors who have or may have an order from the Government. If such a clause were inserted in Government contracts, the contractor would very soon be forced to leave Government contracts alone, or lose all control over his business; as a Trade Union would at any time be in a position to raise the standard rate of wages, or alter the hours of work recognised by it, and the contractor, under penalty of a fine or of being struck off the Government list, would be obliged to conform to the Trade Union demand.

The necessity for any alteration in the clause seems very small, as Mr. Buxton stated that, while some £25,000,000 a year were spent in Government contracts, the number of complaints only amounted to a score or so during the year. This appears to us a satisfactory proof that contractors, as a body, have acted up to the spirit of the clause, and have interpreted its intentions in a manner which has been eminently fair to their workpeople; and we regret that the recommendation of the Departmental Committee has not been followed, and that the clause has been altered so as to introduce the Trade Societies as the official representatives of all workmen, whether they belong to the Trade Union or not.

With regard to the unorganised trades, Mr. Buxton mentioned that he had recently fixed a minimum wage for the lowest class of labour in the clothing trade, and stated that he was looking forward to the passing of the Wages Board Bill this session, and that, so far as the Government was concerned, any rate fixed by the Wages Board would at once be assumed to be the minimum wage in the trade to be paid by all Government contractors. When commenting on the report of the Committee we agreed that the fairest way of dealing with cases, where there was no accepted current rate of wages, would be for the Government, when asking for tenders, to fix the rate to be paid; provided always that an undertaking was given that the contract would not be placed abroad where the scheduled rate could not be enforced; but we regret to see that no mention of such an undertaking was made by Mr. Buxton. This is a most important matter both to employers and employed, as it is no benefit to the latter that the rate at which they are to be paid should be higher than is paid for similar work in other countries, if on this account their employers do not obtain the contract, and, therefore, have not the work to give them. This point was referred to by two speakers, who asked that steps should be taken to see that the money of British taxpayers should find work for British workmen, and that the Government, having fixed a rate of wages to be paid by employers in this country, should not place contracts with foreign manufacturers who were paying a lower rate of wages. The opportunity thus given to the Government of declaring their intention was not made use of, and we are left to conclude that they consider it sufficient to fix, on paper, a rate of wages to be paid to the workpeople in a particular trade, without troubling themselves to take any steps to ensure that their contracts shall be placed in this country, so that the said workpeople may have some wages to receive.

The Engineer Officer in the Navy.

We dissociate ourselves from those who seek to cast a stigma upon the administration of the Navy, and from those who suggest that His Majesty's ships are ill equipped in *matériel* or *personnel*; for, looking back upon the progress made during the last five years, it is impossible for the earnest observer to fail to see that what turbines and electrical equipment have done in that period for our ships, the nucleus crew system and its allied reforms have done for the men and officers, and that these are but the two main lines of an advance which extends throughout the service. When the course of this vast progress is examined, the engineering profession may well feel proud of the part engineers have played in it, for from beginning to end the material progress is as truly the result of the work of engineers as the progress in organisation is the result of the labours of administrators.

In view of this advance, the continued failure of the Admiralty to recognise what they owe to engineers, and their continued indifference to the plain justice of giving engineer officers the same status as torpedo officers, gunnery officers, and navigating officers, is unintelligible. It may be said that engineer officers have played but a moderate part in the improvements of design of prime movers, hulls, guns, machinery and electrical gear, and that the greater part of the progress is due to private contractors and to naval designers in works and in dockyards ashore. The truth is, however, that whether great constructional advances have originated from the engineer officers or not, it has been the task of these officers to take the ships to sea with all the complex innovations built into them, and they have had to operate their part of them and master them, and, by dint of pluck, loyalty and knowledge, they have somehow made these new and complex ships a success. The absurdity, the little-mindedness, the unnecessary discord, that lurks in this relic of class distinctions between officers in His Majesty's ships, is unworthy of our profession and of our time. This is not the place in which to discuss the details of the matter, but we do direct attention to the broad issue, well knowing that this adjustment is required, that it would be welcomed as an honour to the engineering profession both outside and inside the service, and above all that it would add to the efficiency of the Navy.

Driving from the Back Platform.

A criminal case of some interest to tramway managers and to car-drivers was reported in the *Times* of March 6th.

An L.C.C. driver, finding that the front controller was out of order, put the conductor on the front platform, with instructions to make gong signals, while he drove from the rear controller. Presumably the system of signals between the lookout and the driver broke down, for the car ran into the back of a dray and killed a little boy who was clinging to an overhanging ladder. The driver was charged with manslaughter, and the jury found him not guilty. Undoubtedly the verdict was right, for the driver was doing what he was told to do in such cases by the Regulations of his employers.

The position of the L.C.C. in the matter is anomalous, and, viewed apart from the tragedy, distinctly amusing, for, in the words of the Judge, the Council, as tramway owners, direct their people to do that which the Council, as the governors of London, direct that nobody should do. The L.C.C., as governors of London, say that no one should drive without an uninterrupted view, but the L.C.C., as tramway owners, say that in certain cases you should so drive!

Counsel for the defence said that the officials of the tramway company and the L.C.C. (the accident took place on the Highgate-Barnet line) had since reconsidered the rules and regulations, and were submitting a draft of revised regulations to the Commissioner of Police, with a view to final submission to the Board of Trade for confirmation.

We may conclude, therefore, that any other case of this nature occurring within the jurisdiction of the L.C.C. will not find the driver sheltered by his employers' regulations, in which event he might run considerable risk of a verdict of manslaughter.

The practice of taking the car to the sheds with the rear controller when the front controller is damaged is universal, and is not only countenanced, but recommended by the majority of tramway authorities, yet, obviously, it is a practice fraught with risk, as in most cases the driver is unable to see the road ahead or abreast of the front end, and must rely upon gong signals from a man who may be quite unused to such work, and very likely is not even under instruction as a driver. That sort of thing might be done with impunity time after time on lines where traffic is light, but in London, and in busy provincial towns, such procedure is too risky even when the conductor is a fully-qualified driver.

The fact that there is nothing else to be done if the whole service is not to be blocked or delayed should not be allowed to weigh against the risk, however remote, of injury to human beings, and it would be a good thing done if every tramway manager set his face against a practice which at any moment might give him a great deal of trouble and anxiety.

ELECTRICITY AND INCANDESCENT GAS LIGHTING.

In our leading article allusion is made to testimonials regarding the merits of the above illuminants. We make our first selection, from a large number, as showing the position as to their relative costs more than 15 years ago, when the lamps were of the moderately efficient carbon-filament type, and the gas of better quality than is supplied at the present time. The price charged for the electricity was a flat rate of *8d. per unit*, and the gas 2s. 10d. per 1,000.

We are pleased to bear testimony to the beauty and superiority of the electric light as compared with gas: and having practically tested the cost of both lights, we have come to the conclusion that, using equal candle power, the electric light has the advantage, for although the electric light has cost us half as much again as gas would have done for same period we have enjoyed nearly *twice* the light power, besides the advantages of a purer atmosphere, less risk of fire, and considerable saving in cost of broken gas shades, &c., &c.

Sydney Smith & Sons, Ltd.

Sydenham, *January 15th*, 1894.

The extensive premises of this company are now lighted throughout with metallic-filament lamps, and the price of energy has been reduced to 5d. per unit. The present relative cost of electricity and gas may therefore be readily estimated.

When the incandescent gas mantle was introduced it created a little scare in the electrical industry, and the gas companies made the most of their improvement, but those having practical experience of both systems discovered that the cost, light for light, was still in favour of electricity. Thus the following testimony was given:—

We have made use of electric energy for lighting our place from the earliest moment possible.

The installation replaced gas with incandescent burners, and was also used in places where gas had been found unsuitable, and our experience shows that 20 per cent. more light can be obtained for the same money by using electric energy in place of gas.

Geo. Durrant & Son.

Hertford, *August 8th*, 1902.

I am delighted with my electric light bill, it is less than half my gas account for the corresponding quarter of last year.

G. W. Fitton, M.P.S.

49, Fore Street, Hertford,
January 27th, 1902.

It is cheaper than gas. Joseph Wren.

Crown Bakery, Hertford,
April 4th, 1902.

I am quite satisfied with the light, which I find cheaper than incandescent gas lighting.

Charles Massee.

"The Ram," Fore Street, Hertford,
September 1st, 1902.

The cost as compared with gas during the two winter quarters came out in favour of the electric light.

J. W. Smythe.

"Dunseverick," Barnet,
August 29th, 1902.

The cost has come out cheaper than when I used gas.

Alfred Shilling.

"Blenheim," Manor Road, Barnet,
August 29th, 1902.

I formerly used incandescent gas, with its attendant nuisance of mantles. I find the electric light cheaper.

T. W. Leach.

"The Wellington," High Barnet,
August 29th, 1902.

I have much pleasure in testifying as to the *cheapness* and cleanliness of electric light. We used incandescent mantle gas.

Sidney John Orr.

"Holmcliffe," Stapylton Road, Barnet.
August 30th, 1902.

In the matter of cost, I consider it compares very favourably with any other mode of lighting.

George Gurnett.

17, Stapylton Road, Barnet,
August 22nd, 1902.

As one of the first consumers of the electric light in Lewes, I am very well pleased with the result.

I had formerly 25 gas burners in my house, of which 11 were incandescent. These were replaced by 45 16-c.p. lamps, and I find that the cost for the year is less than 3¾d. per unit. Taking 7 units as equivalent to 1,000 ft. of gas, the price works out at 2s. 2¼d. for electric as against 3s. 10d. for gas. Apart from this the cost of renewals and lamps, &c., is much less.

G. Holman, ex-Mayor.

"The Rowans," Lewes,
August 22nd, 1902.

I have not the slightest hesitation in saying that it has been cheaper to use than gas was.

William Gates, Mayor.

Lewes, *August 29th*, 1902.

Our electric light has cost us equal to about 2s. 6d. per 1,000 cubic feet of gas, and gas in Weston is 3s. 2d. per 1,000 (subject to a discount, according to quantity consumed).

Norman & Son.

18, Regent Street, Weston-super-Mare,
October 6th, 1902.

I am very pleased with the light, both as regards quality and steadiness, and the price compares favourably with the corresponding last year's gas account.

Marlborough Conrath.

Eaton House, Sutton, Surrey,
October 11th, 1902.

My accounts come out surprisingly low, and at the rate you are charging I do not see how gas can possibly compete with it.

H. W. Handcock.

5, Albion Road, Sutton, Surrey,
October 11th, 1902.

I am agreeably surprised at the amount of the first quarter's account for electric light and power; the former compares very favourably with the amount I paid for gas during the corresponding quarter.

Frank Beer.

"Bermount," Sutton, Surrey.
October 25th, 1902.

By far the best and most economical form of illuminant.

Thos. A. Pettiver.

Municipal Offices, Sutton, Surrey.
September 25th, 1902.

THE REPORT OF THE TARIFF COMMISSION ON THE ENGINEERING INDUSTRIES.

(*Continued from page* 416.)

So far as can be gathered from the evidence of witnesses, it is considered that duties ranging from 5 to 10 per cent. on electrical machinery, and more for a time on new products, would satisfy the manufacturer, and would be sufficient to enable him to compete on equal terms with the foreigner. A few examples are given, which afford a means by which this view may be tested. Thus, "Manchester Corporation, where to make a nominal saving of a few thousand pounds, a contract valued at £100,000 was given abroad, with a loss of £15,000 to £20,000 in wages alone in the British electrical industry." Now, without defending Manchester's action in placing this contract abroad, we cannot see that a 5 or 10 per cent. duty would have prevented it. The difference in price between the English and the German prices was, if we remember rightly, about 25 per cent. on the machinery section, and for the switchboards the price of the German tender was £39,000, the lowest *really* English being Crompton's at nearly £59,000, a difference of 50 per cent. Of what use would a 5 to 10 per cent. duty have been? Absolutely none. The only difference it would have made is that Manchester would have paid 5 to 10 per cent. more for its machinery and switchboards, and the contracts would have gone abroad just the same.

Next, we come to the St. Pancras contract. "On a tender for St. Pancras of £12,000, in which the witness's firm was the lowest of six English manufacturers, a German company quoted £11,000, but a Belgium firm quoted £7,000 and got the contract. . . . . Had our market been protected they (the Belgians) would never have been tempted to dump here." Again, what good would a 5 or 10 per cent. duty have been here when the lowest English price was 70 per cent. above the Belgian? No one in this country would have been one penny the better, but St. Pancras ratepayers would have paid 5 to 10 per cent. more for their machines. No, it won't do. If we are to have protection at all, don't let us play at it. If we *must* pay more, let it be to some purpose; let us see *something* for our money. Far better than the 5 to 10 per cent. duty, which would mean 10 to 20 per cent. increase in price, as the British manufacturer would at once raise his price by the amount of the duty, and the foreigner would do the same, far better than this would it be to copy the German system of compelling municipalities to favour the home manufacturer within reasonable limits of price.

Turning to the actual evidence, we find that only five witnesses gave evidence in the electrical section, although the evidence of witnesses in some of the other sections has a somewhat indirect bearing on the electrical industry. It is not necessary to abstract at great length the evidence, as the general bearing of this has been already commented upon in dealing with the Commissioners' report.

Mr. Bergtheil's evidence dealt with the question of labour. He said that really skilled labour was hard to find in this country, and that the foreign workman, more particularly the Belgian and German, was superior to the British workman. He comes of a more intelligent class, takes more interest in his work, and is more efficient from the productive point of view in relation to the wages paid. The mechanic, he considers, is better trained than the average British workman, is more thrifty, less addicted to drinking, and altogether better educated than the British workman. This opinion is in marked contrast to that of the Hon. C. A. Parsons whose evidence is found in the Marine Engineering Section. Mr. Parsons says, "Man for man the English workman produced about 60 per cent. more than the foreign workmen when engaged on any kind of large work, but not so in the case of small work." Comparing the English with the Swiss workman, Mr. Parsons shows that the rates of wages of the Swiss workman are little more than half the average paid to British workman, and that the Swiss workman works about 30 per cent. longer hours than in England.

Mr. Bergtheil further points out that it is unfair to the Britisher that after we have spent money and blood in obtaining possession of a country we should give the same trading facilities to foreigners as to Britishers in these new possessions. He instanced a case where a German manufacturer sent his own brother to India and other colonies for the purpose of mining mica. "He gets this stuff direct from the mines in British possessions, ships it by German ships to Hamburg, and eventually becomes possessed of the deposits in our Colonies and possessions on exactly the same lines as an Englishman." The witness was of opinion that the Britisher should be the first to make a profit, and that the proceeds should not be given away to the foreigner for nothing. He suggests that some duty should be put on goods exported from the British possessions to foreign countries, and an import duty put on the foreign finished article. He recognises, however, that duties have to be very carefully imposed, and that each case would have to be very carefully studied. Although advocating Protective Tariffs, Mr. Bergtheil does not appear to have much faith in fiscal reform being of permanent benefit to British industries, but he holds that it would merely give the country "breathing time" in which to remedy its other ills. He appears to be of opinion that the decay of British commerce is due to the loss of nervous energy in the younger generation of men, due to the apathy caused by the financial success of British manufacturers, exporters, &c., in the past, which has resulted in the present generation not being so dependent as their predecessors were on making money. He also considers that public schools and college life have tended to produce a sporting nation to the detriment of other interests.

His suggestions in brief are the instilling of the commercial spirit into the younger generation; the improving of the standard of the principal teachers in the middle and lower class schools; the study of the question of fiscal reform *commercially*; and that more commercial men should enter Parliament than is the case at the present time.

Mr. Hugo Hirst, whose evidence comes next, gives a very extensive and comprehensive review of the whole of the industry, his evidence occupying about 15 pages of printed matter. His views on the question of tariff reform are sufficiently well known to our readers to make it unnecessary to quote largely from his evidence. The Manchester and St. Pancras examples already referred to in dealing with the Report itself, were taken from Mr. Hirst's evidence, and the report generally is largely based upon his evidence. In addition to the examples already given, he cites the case of the Metropolitan Electric Supply Co., of Willesden, who four years ago placed an order of £6,000 for German material, although they particularly wished to give the contracts to an English firm, but none could be found to give the necessary guarantees as to synchronisation. A German firm not only put in a lower tender, but gave the guarantee; and further, undertook to remove the machinery free of charge in case of failure. Obviously, no amount of tariff reform would help us in a case of this kind, as there is no doubt that an English firm could have got the order, even at a higher price than the German quotation, if they had had the same confidence in their designs.

Among other instances given of injury to British industry, some were due to the fact that foreigners were not bound to manufacture patented articles in England. This, however, has been remedied since the evidence was given, although its effect does not appear to be quite what Tariff Reformers anticipated.

Touching upon the question of the American factories which have been started over here, Mr. Hirst says that there is considerable disappointment with the results obtained, and the alleged superior knowledge and technical skill of the American is shown to be very much over-rated. The building of American works in this country has always been a difficult matter for the Tariff Reformer to explain, because if it were true that it paid him so much better to manufacture in his own country and dump material over here, it is not at all easy to see why he should go to the expense of building works in this country, not only saddling himself with the alleged disadvantages of the British manufacturer, but also reducing the output of the works abroad to the extent of the amount previously imported.

On the question of education, Mr. Hirst does not attach much importance to the so-called superior education of German engineers. In Germany, he points out, technical training has been carried out to a very high degree with very poor results commercially. Germans, he maintains, have originated very little, but have been very successful in imitating. He confirms Mr. Parsons's views in saying that "The average English workman produces more and better work than the average American or German." It is often claimed that the German is a better workman than the Britisher on account of the discipline acquired as a result of military training. Mr. Hirst, whilst agreeing that the training may make a man dutiful, says that it tends to kill originality.

Mr. Hirst is rather severe on the British commercial traveller. "Good English commercial travellers," he says, "are rare and very expensive. The average English commercial traveller is generally a man who considers himself unsuitable for indoor work. He probably has not learnt the details of his own business, and consequently lacks authority and power of persuasion with his own customers. In sending in his reports he is usually quite oblivious as to the doings of competitors which his house is thirsting to know."

On the question of cost, Mr. Hirst shows conclusively that except in special industries, where manual labour is the principal portion of the work, nearly everything could be made as cheaply in this country as elsewhere. As some of the comparisons he makes are with Swiss manufacturers, this is particularly gratifying, in view of the fact, as pointed out by Mr. Parsons, that the rates of wages of the Swiss are little more than half those of the British workman, and that he works 30 per cent. longer. The advantages of water freight in this country are a myth, says Mr. Hirst, owing to the fact that so many canals are controlled by the railway companies. In Germany water freight is considerably cheaper than railway freight. Railway freight in Germany is less than half what it is in England, and by water there is a considerable reduction. He compares the methods of the German and Swiss railways with the British railways, showing how the latter act adversely on British industries. The L. & N.W. Railway wanted £4,000 for a siding into the G.E.C. Witton Works, and it would have cost the G.E. Co. an equal amount to complete their portion of the work. The railway company would have charged them the ordinary Parliamentary rates, which were in some cases dearer than the ordinary competition rates from Birmingham. Hence there was no advantage in putting down a siding. Contrasting this with the Swiss railways, Mr. Hirst explained that, around Zurich, a railway has been built upon which any manufacturer can have land cheaply, so that the moment an article is manufactured in his shop it is practically free on rail. We might here remind our readers that in both Switzerland and Germany, the railways are State-owned, so that all the arguments which Mr. Hirst puts forward in this connection are arguments in favour of railway nationalisation. Mr. Hirst makes a rather important admission when he says, "The advantages of protection do not lie merely in the amount of duty, but in the fact that the system necessitates commercial treaties watched over by a Government department, such as a Ministry of Commerce." Thus, the Austrian Government watches the rates of railway companies, and if too high, puts the rates down on goods which suffer from foreign competition. "Certain articles which to-day cost 30s.," said Mr. Hirst, "cost £15 15 years ago, yet the railway rate is exactly the same as it was then." In a protected country a manufacturer can bring such grievances before a Minister of Commerce, and his department can remedy or relieve them. It is not left to a single firm to carry on a powerless fight against the railway company. This, and many other arguments advanced by Mr. Hirst, are really very important, although it is difficult to see that they have much bearing upon the subject of tariff reform. Rates of transport, the appointment of a Minister of Commerce, classification of foreign goods, fair wages clauses, technical education, and many other highly important features of our trade which are dealt with in Mr. Hirst's very valuable contribution to the subject, are matters to which consideration may be given, quite apart from any question of the merits of Free Trade or Protection.

(To be concluded.)

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Report of the Tariff Commission.

This article is most interesting, but the last paragraph in your issue of March 12th is most misleading. As your contributor himself knows, you have only to refer to the analysed table of exports and imports you published last week to see this is so. Take the principal *protected countries* and compare the exports and imports individually; they are interesting reading to the Englishman. Our principal exports are to our Colonies and the South American States. When an article is written in a trade paper it should not be made to suit the views of the writer.

Carter & Wright.

Halifax, *March 12th*, 1909.

Supply by Meter, or Contract?

Referring to the second paragraph of the above article by Mr. W. A. Toppin in your issue of the 5th inst., his remarks regarding the modern mercury meters (rotor?) tend to give readers the impression that the results obtained by the use of this type are rather unsatisfactory, and therefore I should esteem it a favour if the writer would kindly give some further information on the following points:—

1. What was the capacity of this particular mercury meter? as, to be capable of carrying 4 amperes, I should imagine it to be rather too large a size for registering the consumption of such a small installation (four lights). This fact, however, should not account for the extremely large difference shown in the comparison with the registration on the electrolytic meter which was subsequently used.

2. What were the dates and results of the supply authority's tests on both meters before fixture, and also the results of their tests of the mercury meter, after removal, on $1\frac{1}{6}$ and $3\frac{1}{2}$ C.P. lamps respectively, which were stated to be very great?

3. How long had the mercury meter been in circuit on this installation before its removal?

The writer also states that the cheapest meters are, fortunately, the most accurate for small loads, and seems to favour those of electrolytic type. Whilst agreeing with him that the capital cost of these is low, I must beg to remind him that they lack the advantage of a permanent register as compared with the rotor type; thus, any errors made in reading consumptions on the former cannot be checked after the meters have been reset to zero, and, in some cases, errors are very liable to occur owing to the presence of scum on the surface of the electrolyte and interiors of tubes rendering the operation of reading very difficult.

In the event of a large quantity of this electrolytic type being in use, the work of resetting occupies an appreciable time. Also, with certain types of electrolytic meters it is difficult to ascertain on casual inspection whether they are registering on very low loads, this difficulty not being present with rotor-type meters, as their starting currents can be very easily and quickly determined.

J. C. L. V., A.M.I.E.E.

March 8th, 1909.

I was going to write last week with reference to the article in your issue of March 5th on this subject, but thought there would be many other people taking the matter up. As they have not done so, and it seems a pity to let some of the statements go, I hope I am not too late to say a word on the subject.

The whole article is very vague, and deals in generalities, as, for instance, the statement, "the percentage . . . was . . . very great." It would have been much more to the point if we had been told what this error actually was. Seeing that the meter in question started with an 8-C.P. lamp, there could not have been very much friction, and the error on a 16 or 32-C.P. lamp, supposing the meter was properly proportioned to the size of the job (another point which is left in doubt) could not have been much on a really modern meter, but the real joke of the matter is that the electrolytic meter

trebled or quadrupled (more vagueness) the registration previously obtained. The motor meter must obviously have been 300 per cent. or 400 per cent. slow, supposing the electrolytic meter was right. As this slowness cannot be due to friction, seeing that the meter started all right, it could only be due to an error in the counter. I have never heard of an error of this magnitude. Perhaps Mr. Toppin means 3 per cent. or 4 per cent., instead of trebled or quadrupled!

As regards the general argument of charge by contract or meter, the former method has had a good trial and failed. The suggestion to give only daylight supply seems rather feeble, and makes one think that electricity really is only in its infancy.

Unonot.

March 15th, 1909.

Ownership of Service Line.

Referring to the reply of your legal contributor on page 208 of the ELECTRICAL REVIEW, February 5th, 1909, I think it is open to question whether Sec. 20 of the Gasworks Clauses Act, 1847, applies to the case in point. The cable on the consumer's premises is a "service line." It is *not* a "main," for by definition a main must be in a "street or public place" (62 and 63 Vict., c. 19, Sch., cl. 1). Doubtless the service line is also covered by the definition of an "electric line," but would it belong to the undertakers? Under clause 27 (1) of the statute quoted the service line on the consumer's premises is to be paid for by the owner or occupier. Surely, then, it becomes his property, although under control of the undertakers? I do not think this question of ownership has ever been decided, but it is an interesting one. I believe it is not an unknown case for successive new tenants to pay the full customary connecting charge when there is no work done except the fitting-in of new fuses.

Furthermore, if the supply is discontinued and the service lines are removed, should not the then value of these lines be repaid to the consumer? In the case of bare wire services, which are used extensively in India, the depreciation is very small, and I think the lines may sometimes be paid for more than once.

J. W. Meares.

Calcutta.

An Overcrowded Profession.

Who are these "Layman" and "Amonyd" who practically agree with companies in paying low salaries (?) to, in some cases really good, men who have been well trained and at great expense? "Layman," for instance, says: "Employers, whether municipalities or companies, pay the lowest wage they can, and under present conditions they are right in doing so." I submit that what they call the "lowest wage" is not a wage at all—not even an "existing" wage! In any case, why should these well-trained men be paid less than, say, the coal trimmers, cleaners, engine-room labourers, &c.?

Now "Amonyd" says that £700 appears to him an exceptionally high figure. How did he get his training, assuming he is an electrical engineer? I won't say it cannot be done for less than £700, but that is by no means an "exceptionally" high figure. And, *re* the advertisement he quotes, he says that the "young gentleman" who pays the 30 guineas is refunded £26. Yes, after 12 months, and at the rate of 10s. a week. But for two years, at any rate, he has to keep himself, for one year entirely, and for the second year partly!

It would be interesting to know what, if not who, these persons are, and what their experiences have been, and how they trained, &c.

I have recently been an unfortunate victim of influence, at someone else's back. I dare say "'Avinsum" knows the someone else; but we wander.

Bus-bar.

March 12th, 1909.

"Layman," in his article on central station salaries, certainly does not belie his *nom de plume*, and gives one the impression of one who is personally interested in the blood-sucking methods of the electricity supply companies, of getting their work done for little or no expense.

The "only" type of man which he suggests should enter the profession has, alas, taken it by storm, and brought about its ruination as far as central station work is concerned at the present time, as it is the "Lord Tom Noddy" type that has caused such advertisements as this—"Wanted.—Switchboard attendant; must have had experience in the working of a D.C. station, with batteries; wages 10s. per week of 56 hours"—to appear in the papers. True, they may be the only men that can afford to take the job, but I, personally, regard positions filled by incompetent men as the outcome of this, the competent man refusing to look at jobs with such a low remuneration.

During the last four years I have worked at five central stations, and have always noticed that it is the man of "means" that has held the "No salary," or the 10s. per week job. I know of a power house in London where there have been five Faraday House men employed in succession as switchboard attendants for the enormous wage of 5s. per week.

Now, I ask "Layman," who keeps the salaries low, if the man with seven years' keep at his back is the only one to enter the profession. I say it would be better if he kept outside. As the tendency is to consider a man capable of running a shift after he has had five years' experience in central station routine, we should hear of advertisements something after this style:—Wanted.—Young gentleman, with college education, and of independent means, in central station; promoted to engineer-in-charge after five years' service. Testimonials "Bank Book," which will be returned by registered post after perusal.

With regard to the terms of agreement system, I would say that I was nearly trapped, but for the timely warning of a municipal chief engineer. So I say that although the "Secret Society" which "Layman" speaks of is really impossible, it would help applicants very considerably in applying for jobs, and, in addition, would save many a poor shift engineer strong adjectives.

W. P. H.

March 15th, 1909.

"Layman," in his criticism of my letter, says "that central station work is not subject to the fluctuations felt so severely by manufacturing and trading concerns, and therefore stability of the appointment provided is some compensation for the slenderness of the commencing salaries and the slow rate of progress." How, then, does he attempt to explain the fact that one of the largest of the electric supply companies has given some scores of its engineers their notices during the last few months *on the excuse that the company was in a parlous state owing to bad times?* Yet "Layman" says our berths are stable. He does not agree with me that companies are dividend hunters; perhaps he will kindly tell us what they are. Are they run on philanthropic principles for the benefit of their staffs, or are they benevolent institutions where the infirm and decrepit can obtain light work at small wages? I naturally fell into the popular error and thought companies were promoted to earn dividends, but I am wrong; they are not there to earn dividends, that would be a calamity, they are there to sink into debt by paying extortionate salaries and giving their goods away.

Funny thing, then, that in your "City Notes" two large companies should explain at great length their inability to earn dividends. The directors of these companies are, like myself, misinformed—they are worrying about a mere trifle like a dividend.

I quite agree with his remarks that no one should enter the electrical profession who does not possess sufficient means to pay for a proper training and support himself for seven years, but would like to add the amendment that in the case of companies the term of seven years be increased to seventeen. "Layman" thinks we are all Gamaliels, whose rewarder was God and God only.

His remarks upon, to use his own expression, "those unfortunate people of the lower middle classes" may be quite true, I do not know—not being unfortunate, but I am quite prepared to accept them as the truth, for "Layman" writes so feelingly about them that his remarks bear the hall-mark of experience.

D

As I have been properly trained and supported for more than seven years I cannot call myself "unfortunate."

I still adhere to my statement that municipalities pay better wages to their lower officials than do companies, and if "Layman" still takes exception to this I would advise him to study facts and not give play to a lively imagination.

"Layman" says that municipalities have not the excuse of dividend hunting for paying low wages; he also tells us that companies are not dividend hunters. Perhaps, then, he will tell us what excuse the companies have for paying low wages.

Adsum.

The conglomerated and acrid criticism contained in the letter signed "Adsum," in your last issue, would seem to leave little unsaid as to the present-day prospects of the electrical engineer aspirant. In case, however, there is any fear of the young engineers of this country accepting bodily the almost illimitable advice therein offered by one of such mature experience, it may be advisable to modify, if not entirely refute, your correspondent's statements.

Mention of the *large supply companies*, so early and significantly introduced into the letter under notice, would seem to imply that the writer had transferred from the velvet of the corporation to the brattice of the company. Whether this is so or not, the adage remains, and we have only to deal with the ill-advised leaping at unscrupulous advertisements put forward by supply companies. Gratuitous advice is not offered here. A few facts about at least one of the companies coming within the pale of your correspondent's vehemence may save hurtful misconception on the part of young persons contemplating entry into this admittedly overcrowded, but by no means uneventful, profession of ours.

In the first place, the company referred to has never, during several years past, turned any junior away upon completion of agreement, but has in every case provided continuity of employment and an improved position consistent with the ability of the assistant. Secondly, they have not found the assistants, during the period of training, of any more commercial value than the scale of pay embodied in the agreement. Further, they have not signed-on any assistant without several weeks of trial service, found equally necessary and advisable on both sides.

Lastly, they have always recommended their assistants by special written testimony for improved positions, where the agreement has been honourably and sensibly kept; and they have living testimony of the success of the training in many parts of the country.

Electra.

March 10th, 1909.

In answer to the letter of "Amonyd"—at first sight it would seem that I was rather a fool to part with my money in the way I did, instead of opening a shop of some description! I would, however, point out to "Amonyd" that for my £700 I at least received a thorough training, and did not enter the profession by the back door. Having had this advantage, combined with a public school and university education and good central station experience, I am fit for and capable of taking charge of a large works with credit to myself and my employers.

What can be said, however, of the man "with the previous experience," who pays £30 to be "trained as chief assistant," whatever this may mean? What will the training consist of, and why especially "chief assistant?" Why not put down the bait of "chief," or "consulting engineer," or "electrical expert" instead? What does the training of a "chief assistant" especially consist of?

May I suggest that the training of this man may incidentally save the "lighting station" a sum of 25s. a week for one year, and 12s. 6d. a week the second year, so that after very generously giving the unfortunate embryo chief assistant £26 out of the £30 back, the said lighting station will save £71 10s. in two years by being able to do without a properly paid switchboard attendant. I therefore submit that the person "with previous experience" (for which he will no doubt have paid) who pays £30 to be trained as "chief assistant," will have proved himself to be a far greater fool than myself, because I have had valuable training and experience, whereas he will only find that he has been made a "chief assistant," not by virtue of his own knowledge but by "training." In answering advertisements for jobs he can state: "I have been trained as chief assistant at the Slocum-on-the-Green electric light station."

Ohm Sick.

March 13th, 1909.

Institution of Colliery and Mining Electrical Engineers.

On behalf of the above, I take the liberty of bringing to the notice of your readers the forming of this Institution. The need for such has been apparent from the correspondence on colliery matters in your paper from time to time, and as you will see from the rules that have been drawn up, the members will be composed principally of working colliery and mines electrical engineers or electricians.

We purpose holding meetings for lectures and discussions at various centres, due notice of which, with your kind permission, will be given in this paper.

We hope by our lectures, discussions and practical suggestions to keep up a high standard of workmanship and materials best suited to colliery work, and so decrease the number of electrical fatalities in collieries.

For the convenience of members and local representation of the Institution, our committee members are appointed from each mining section of the United Kingdom.

The subscription is one guinea per annum.

We hope to hold the inaugural meeting in Manchester at an early date, and in the meantime would be pleased to hear from prospective members as early as possible.

Further particulars may be obtained from the undersigned, the secretary (*pro tem*), at 3, Moresby Parks, Whitehaven.

RULES.

1. That each member must have been in charge of a colliery electrical plant for at least one year, or have worked as assistant for at least two years previous to application for membership.
2. That each member shall be prepared to give a satisfactory reference or testimonial from present or past managers.
3. That each member shall be thoroughly acquainted with the Rules and Regulations of the Mines Acts, 1887-8 and 1899, relating to electricity in mines.
4. That each member must be prepared to pass a practical examination on electrical work by the Institution in order to obtain a certificate of competency given by the Institution.
5. That no new member shall be admitted unless the Committee are absolutely satisfied that he is thoroughly experienced and fully competent to take charge of any colliery or mining plant.
6. That the Committee have the right to terminate a membership upon thorough investigation of wilful neglect of his duties, or incompetency, or through any actions discreditable to the Institution.
7. That all the members shall work together for the benefit and goodwill of the Institution and other members.

J. Williams.

Dublin Electricity Supply.

I had hoped it would not be necessary for me to trespass further upon your valuable space than to correct a clerical error in transcribing West Bromwich instead of West Brompton, but, from your comments in your current issue, it is evident that you still misunderstand the position taken up in my previous letter.

No engineer occupying a responsible position can object to the fullest criticism, provided it is based upon ascertained and reliable facts. On the contrary, he is, or should be, grateful for any friendly criticism which will assist him to improve the position of the undertaking in his charge.

In your comments this week you state: "We were content to take as reliable the average figures of 25 *similar* stations given in the report upon which our article was based, not, however, as Mr. Ruddle suggests, without a very careful study of its contents so far as they were available at the time for the public." Such a statement as this completely nullifies your sweeping condemnation of the Dublin undertaking. It is perhaps excusable for the city treasurer and city accountant, in abstracting figures from the *Electrical Times* tables, to think that the list they gave represented stations working under similar conditions, but I cannot understand how the editors of a responsible technical journal "after careful study" should endorse this far-fetched assumption. The most superficial examination would have shown that not one single instance was directly comparable with Dublin. The list comprises generating stations, some

of which are combined with destructors, which not only provide cheap fuel but furnish a valuable motor load at a remunerative price; some stations generate direct current and have storage batteries to help them over the peak of the load and to take the entire load at times of light demand, thus effecting considerable economies in running costs; some have condensing plant, and others work non-condensing; some are favourably situated with coal pits adjacent to the stations and with large demands for power supply; others are at a long distance from collieries and with small demand for power purposes; some places are largely helped in their output by frequent fogs; and others enjoy a heavy business load in the day time with an almost equally heavy pleasure load at night; in some instances the generating stations are heavily loaded, and in others more than 50 per cent. of the plant is held in reserve; in some the distribution systems are lightly loaded, and in others the mains are heavily congested. And yet, according to your argument, all are working under similar conditions.

You altogether mistake my views upon the necessity for a depreciation or "obsolescence" fund. I am strongly in favour of building up such a fund as soon as it is possible to do so, and, in conclusion, I would only ask that any further criticisms you may think well to make upon the Dublin undertaking should be of the constructive rather than the destructive order, as I am sure you will agree that, in the interests of the ratepayers, it is better to improve the position of their property rather than to depreciate it by comments based upon insufficient knowledge of the actual facts and conditions, and the difficulties to be overcome.

M. Ruddle,
City Electrical Engineer.

Dublin, *March 13th*, 1909.

The Maintenance of Large Gas Engines.

Your correspondent "W. C.," in his letter of the 8th inst., in referring to the "cost of repairs in labour alone" in connection with a Cockerill type of gas engine, says that the ignition upkeep cost £50 during 12 months, "as actually paid to electricians." As this sum amounts to one-fifth of the costs for repairs in labour—*i.e.*, £250—the item is worthy of further consideration. All gas engines, of whatever size, are dependent upon the ignition of the explosive mixture of gas and air, and in this respect the Cockerill engine only differs from others in that, owing to its large cylinder capacity, a *miss-fire* has a more serious effect than in smaller quick-revolution engines, though absolute failure of the ignition system is the same in all cases. It need hardly be pointed out that the installation of a gas engine does not necessarily involve the services of an electrician at a cost of £50 per annum, unless the circumstances are exceptional; usually the operator has to look after this detail. Possibly others having experience with the Cockerill engine will have something to say on the subject.

Horace Allen.

March 15th, 1909.

Altered Conditions of Contract.

We notice that in your issue of to-day's date, under "Contracts Closed," you state that the Wandsworth Council have placed the contract for alterations to the Newnes Public Library with us. This statement is not quite correct. Our tender for this work was accepted by the Council, but on receiving the "articles of agreement" and specification, we noticed that conditions not asked for in the specification to which we tendered had been inserted, and that in the clause specifying that the work was to be carried out ". . . to the satisfaction of the consulting electrical engineer . . ." the name of an electrical contractor had been written in as the consulting engineer.

We wrote to the Clerk to the Council, pointing out that we required time to consider the new conditions, and that we could not agree to carry out the work under the supervision of a contractor with whom we were frequently in competition.

We have now heard from the Clerk that the Council will make other arrangements for carrying out this work.

We think we shall have the approval of consulting engineers and contractors in the course we have taken.

Donnison, Sillem & Co.

London, W., *March 12th*, 1909.

Free Samples.

On reading your article on "Free Samples," contributed by Mr. Borlase Matthews, we are constrained to write you on the matter of "samples" concerned in a contract for supplies to the tramways department of so large a city as that of Birmingham. The schedule calls for ordinary electric lighting accessories, but the specification distinctly states that they are to be exactly as sealed samples. On going to inspect the sealed samples, it is found that the whole of them are of the particular pattern supplied by one firm only. When we wrote to the manager to know if samples of equivalent goods would be accepted, we were clearly informed that they would not. The obvious conclusion to be drawn from this is that one firm, and one firm only, can possibly stand a chance of the contract; and if this is the case, where is the sense in putting other firms to all the trouble and expense of going to see the sealed samples and tendering?

There is also another grievance which supply houses might express against the Birmingham Corporation: the result of the tenders is never advertised—in the trade journals at any rate. The London County Council may be less enlightened or more questionable than the Corporation of Birmingham, otherwise it is difficult to understand why the one should publish the results of tendering and the other keep them severely dark. Corporations which maintain secrecy as to the result of their call for tenders have only to blame themselves if there is a suggestion of "hole-and-corner work."

Factors.

March 12th, 1909.

Electricity in Mines.

Kindly allow me to reply to your correspondent who writes under the inappropriate *nom de plume* "Mines Electrical Engineer." There are, no doubt, many more readers besides myself who would suggest to this correspondent that his funny criticisms of shop-trained men should be in future forwarded to *Ally Sloper*, as a more suitable paper for them than our estimable Electrical Review. His contempt for us shop-trained men and our poor qualifications is, indeed, comical in the extreme, but it is singularly endemic among that class of workmen who would be affronted if called wiremen instead of electricians. However, he, like many more, has a lot to learn ere he is advanced enough to be a fit and proper person to sit as judge over us. His ludicrousness reaches a climax when he styles himself an "Electrical Engineer." Engineer, forsooth! does he imagine that wire-twisting entitles him to this term? It would be interesting to learn from one who has such contempt for shop-trained men, why, when, and where he adopted it. Maybe he has received permission to use it as a kind of ballast from some correspondence college. He tries again to be funny by saying that "it is not the man who makes the instrument but the man who plays on it," &c., but this is a poor attempt of his to play with figures of speech. Even Kubelik would seem a pitiable figure playing a concerto on a fiddle with a cracked belly, and unless he has had shop training even he would not attempt to repair that cracked fiddle. Your correspondent glories in the fact that he is not a shop-trained man, and evidently he is not ashamed to admit that he is fully content to leave the entire responsibility of his own work in the hands of his manager. He would also entrust the care of an installation to a wireman in preference to the shopman. For a moment let us compare the two men. A typical wireman's functions are, I take it, to run wires from point to point; do a little jointing, the less the better; plug walls, run casing and pipe, and do a little simple testing—this is the alpha and omega of his functions as a wireman. The works-trained man, who is not specialising, endeavours to get a thorough knowledge of the construction of the machinery and appliances which he hopes sooner or later to have charge of, and he studies every

detail, making note of each weak point, and speculating as to what would be likely to occur under certain working conditions. Like the other man, he gets testing experience, which, however, is not of such a simple kind. He can also sweat lugs on cable, trim ends, and, if need be, make joints equally as well as, if not better than, the other man. One has but to glance behind a modern switchboard to convince himself of the truth of this, and if "Mines Electrical Engineer" thinks he is the only person capable of doing anything in the way of repairs to installation work, I would advise him to visit one of the well-known manufacturing firms in Manchester, and he will there see work done, and done well, too, by shop-trained men. When in charge of an installation a man with shop training would be able, through being a skilled mechanic, to save many things from being consigned to the scrap heap. The veriest noodle knows that a breakdown in an installation takes place generally in either the machinery or auxiliary fittings, and I unhesitatingly say that the man who constructed these is the right man to repair them. A wire twister can run wires, I doubt not, but the man who runs the strings from fiddle peg to tail piece is not always the player.

James Brandreth.

Liverpool, *March 11th*, 1909.

"Colliery Electrician" does not appear to be quite familiar with the contents of my former letter. What I did say was that I would sooner trust a wireman, &c., with any of my electrical plant than a man whose only recommendation was shop experience. I did not say a man with no shop experience. Then he asks me how this man would shape with a burnt-out machine. Well, I should say if the machine was burnt out it would appear to me to be more of a job for the makers, because the average colliery does not, as a rule, stock all the material for this class of work. The other work that the electrician ought to be attending to would be neglected if he were devoting the whole of his time to that particular machine, because he must know that repairs of that description are not done in a day, and if he is obliged to keep leaving that particular job to attend to other things, it is going to take some time to get the job finished. If that particular machine should cause any part of the mine to become idle, the loss in output of coal would probably pay three or four times over for the necessary repairs to that machine by a reliable firm. If the burnt-out machine he refers to means an armature coil or two, it does not appear to me to be a difficult matter for a wireman of ordinary intelligence to replace these, when this can be done by shop labourers.

I do not see why there should be such a thing as a burnt-out machine at a colliery, if the said machine is large enough for the work it is required to do, properly cleaned and tested every week, and suitable fuses or circuit breakers used, with a competent man to run it. During the years I have been at my colliery I have never had such a thing as a burnt-out machine; I have had armatures go wrong from other causes, but I have soon taken steps to put that kind of thing in order, and as to turning up commutators and slip rings, I do not consider that a great feat of engineering skill. Surely any colliery that is worth the name has a fitting shop, with fitters and turners who are capable of doing that kind of thing, and as to re-bushing a set of motor bearings, I should say, with anything like ordinary care, these ought to last some years. If at any time motor bearings are required, all you need do is to take the machine number, send it to the makers, and state requirements, because most makers of reputation work to standard sizes, and they can no doubt supply you with the correct article, and cheaper than you could make it. So I do not see any difficulty in this matter; all you have got to do is to take out the old and pop in the new. Sometimes a slight alteration is needed, but generally the ordinary fitter can put that right.

I may say I am quite content to abide by the manager's decision in all things in reference to mine work, because I cannot do anything else; he engaged me, and I am responsible to him only for all electrical plant. He is responsible for the electrical plant to other powers that I do not wish to have anything to do with. I should look fine being held responsible by the Government, if my manager was silly enough to give orders for an open motor to be placed in a dangerous position. Then, again, "Colliery Electrician" asks me what I would do if I was asked to take charge of a plant that was not up to Home Office rules; would I be content to let it remain as it was, and let the manager take the responsibility? Certainly not; what I should do would be to skip around and examine everything electrical, and all that had to do with it; then I should at once give my report to the manager, stating all defects, and how same could be put in order to meet the Home Office rules. If he did not think fit to allow me to make the alterations, then I would be quite content to allow the manager to take the responsibility.

With reference to the manager and written authority, I may say there is nothing in the special rules to this effect. I did not notice anything in "Colliery Electrician's" letter with reference to sparking and flashing caused by unexpected falls of roof, so I still say there is no mention made of these. I daresay I have had much worse experiences than "Colliery Electrician" in many cases, but I am pleased to say that I have made things much more comfortable for myself, by strict attention to my duty and system of working and tuition of my men, and not by troubling my head about what other people may do; their affairs I have nothing to do with.

In reply to "J. H. P.," I quite agree with him that the electrician should have a certain amount of knowledge in mechanical work, as far as his electrical apparatus is concerned, but as to having a sound mechanical training, that is all piffle. What is the colliery engine-wright for? The electrician ought to be a man of sound electrical training, with some mechanical knowledge, and it does not require a great amount of the latter to know if switchgear, motors, &c., are in order.

With regard to one remark of "J. H. P.," "See that your electrical foreman, &c.," there ought not to be any electrical foremen at a colliery, but electricians-in-charge, subject to the manager. Reading between the lines of "J. H. P.'s" letter, it appears to me he is more mechanical than electrical; if this is so, he ought not to have charge, but the electrical foreman he recommends. It does sound bad to me; I have charge of such and such, but see that your electrical foreman has all the qualifications required to run the colliery, and take the responsibility.

What is the use of installing gas-tight apparatus if you have no proper system of inspection? Is "J. H. P." absolutely certain that after inspection his gas-tight electrical apparatus is gas-tight? How is one to know that it has been erected gas-tight? One should go down the mine and see it erected under his personal supervision, as I do, and satisfy himself that it has been fixed in a proper manner. There is no excuse for down right laziness.

In conclusion, I may say I trust no one to do my work, although I have several assistants; I personally supervise all electrical work on behalf of the manager, and have it done my way. If it is right, I take the credit; if wrong, I take the blame. I don't try to push the responsibility on to somebody else. I represent the electrical department, the mechanical engineer the mechanical department. We both work hand-in-hand for the good of the firm, and each of us is responsible to the manager for his own particular class of work.

Mines Electrical Engineer.

Stassano Electric Furnaces.—The Elektro-Stassano-ofen Gesellschaft is the title of a new company which has just been formed in Vienna to work the patent rights of the Stassano electric smelting system in Austria-Hungary. The founders are the Maschinenfabrik Gesellschaft vorm. Tanner, Laetoch & Co., the United Electricity Co., formerly B. Egger & Co., both of Vienna, and the St. Poltner Weisheisen und Stahlgiesserei Leopold Gasser of St. Polten.

"Oriflamme" Lamps.—We understand that the Oliver Arc Lamp, Ltd., have recently secured orders or supplied lamps for street lighting in Hampstead, Leeds (extension) and Tottenham, and also from the Barry Railway, Great Western Railway (25-period alternating-current lamps) and H.M. Dockyards at Hong Kong and Sheerness (extension) and others.

PARLIAMENTARY.

North Metropolitan Electric Power Co.'s Bill.

On Thursday of last week a Select Committee of the House of Commons, under the chairmanship of Mr. Partington, considered this Bill. Mr. Balfour Browne, K.C., and Mr. Tyldesley Jones were for the promoters, and the opponents were the West Ham Corporation (represented by Mr. E. Morten), the Hendon U.D.C. (represented by Mr. E. Pollock, K.C.), the Middlesex County Council, Hertfordshire County Council, and the Cheshunt U.D.C.

Mr. Browne opened the case, and said that the North Metropolitan Co. was incorporated by an Act of 1900 to supply electricity for power over an area to the north of London covering 325 square miles, but they were not allowed to supply in Hornsey, Edmonton and Walthamstow, without the consent of the local authorities. Under that Act they had erected an important station at Brimsdown. In 1902 they obtained a further Act which authorised them to acquire the generating station of the Willesden U.D.C., and also to supply current to the Stoke Newington Borough Council. By an Act of 1907 a special district was formed in which the company was empowered to supply to persons requiring a supply for power, and also to supply for lighting under certain conditions. At that time the London County Council was before Parliament with a Bill for making it the supply authority, and the Board of Trade struck out the districts of Hendon, Finchley, Friern Barnet, Chingford, Waltham, Hornsey and Walthamstow from the Metropolitan Co.'s Bill. Now the London County Council was no longer seeking to be the authority, and accordingly the company asked that these districts, with the exception of Hornsey and Walthamstow, should be included in the special area. They did not seek to include Hornsey and Walthamstow, because at the time the company first came to Parliament in 1900 they made a bargain with the local authorities of these districts that they would not come in without their consent. The opposition from the West Ham Corporation came on Clause 5 of the Bill. At the present time the company had power to supply railways for traction purposes. For instance, it was possible for the company to supply from Brimsdown, the Great Eastern Railway Co. with energy to run its trains through West Ham, and with energy to light the carriages, but they could not supply the railway company with current to light their stations. It was, of course, not likely that any railway company would enter into an agreement to take a supply for traction, and then into another agreement with a separate undertaker to get a supply of current for lighting stations; and consequently, under Clause 5, the promoters were seeking power to supply to railway companies for all purposes. The Board of Trade has made the following report with reference to the clause:—"It appears, under this clause, that the company may supply for use in workshops and the lighting of stations in districts outside their own area of supply. The Board suggest that it may be desirable to provide that any supplies given under the clause for use within the area of an authorised distributor shall not be given without the consent of that distributor; subject to the proviso that, if such consent is unreasonably withheld, the matter shall be determined by the Board of Trade." They had embodied that in a clause in the Bill, and he contended that it was one the West Ham Corporation should be satisfied with. Although such a clause would operate within the district through which the Great Eastern Railway Co. ran if that company obtained a supply, yet no other local authority had objected.

Mr. J. Devonshire, the managing director of the company, gave evidence bearing out counsel's opening statement.

In cross-examination by Mr. E. Pollock, he said that the company had given the Finchley U.D.C. a veto because they were already lighting the station buildings there. The Hendon District Council had transferred their powers under the Electric Lighting Act to the Hendon Electric Light Co. The Hendon Co., in which the North Metropolitan Co. held £5,000 debentures, took its bulk supply from them, and they would have a veto against the North Metropolitan Co. lighting stations in their area. Consequently, the promoters could not agree to the local authority also having a veto.

Answering Mr. Morten, Witness said he could not agree to West Ham being excluded, or otherwise other districts would advance claims in the House of Lords.

Mr. Morten, on behalf of West Ham, said the matter was an important one, as it created a precedent. This was the third time the Corporation had had to appear against the attempt of the company to get powers to supply railways other than for haulage purposes. By the Bill the company would be able to supply the whole of the Great Eastern Railway Co.'s works at Stratford, where 5,000 men were employed, and the West Ham Corporation, which had its own generating station, would be exposed to competition.

The Chairman: You really object to competition?

Mr. Morten said that was really so. The Legislature had never allowed competition where a local authority was doing its duty properly.

Mr. E. Pollock addressed the Committee on behalf of the Hendon U.D.C., and contended that they were only trying to preserve the rights which Parliament had agreed they had. The electric lighting provisional order was first transferred to Crompton and Co., and afterwards to the Hendon Electric Supply Co., but the concern was purchaseable by the local authority in 1914 and at intervals afterwards. Under those circumstances the local authority objected to the Power Co. coming in. He was perfectly willing to come into the special district, provided that they had a veto as was given to Finchley.

The Committee passed the preamble of the Bill, but gave the Hendon U.D.C. a veto on Clause 4. Clause 5 was passed, subject to the proviso giving the local authority the veto, with an appeal to the Board of Trade if their consent was unreasonably withheld.

Submarine Cable Companies.—In the Parliamentary Papers last week, Mr. Harold Cox asked the Postmaster-General which of the Atlantic Cable Companies is principally employed to convey messages intended for transmission over the Pacific cable, and what is the nationality of the company. Mr. Buxton replied that telegrams for or from the Pacific cable which are not ordered by the sender for transmission by any particular route across the Atlantic, are divided equally between the Anglo-American Telegraph Co. and the Direct United States Cable Co. (both British companies) on the one hand, and the Commercial Cable Co. (an American company whose cables are landed on British territory) on the other hand. Replying to a further question, Mr. Buxton stated that in normal circumstances telegrams to or from the Pacific cable are transmitted across the American Continent over lines which pass solely over British territory. The route followed is *via* Montreal, and the lines are mainly those of the Canadian Pacific Railway Co.

London County Council Tramways.—The Standing Orders Committee of the House of Commons has agreed to the L.C.C. proceeding with their Tramways Bill on condition that the following tramways are struck out:—No. 1, from Harrow Road to Sutherland Avenue; No. 3, junction from City Road to New North Road; No. 4, junction from Essex Road to Kingsland Road; No. 5, from Kingsland Road to Dalston Lane; No. 6, from Kingsland High Street to Dalston Lane; No. 7, from Mare Street, Hackney, to Victoria Park Road; and No. 9, from Putney Bridge to High Street, Putney.

Tramways in Dublin.—The Standing Orders Committee of the House of Commons has agreed to the Midland-Great Western Railway of Ireland proceeding with their Bill on condition that proof is given to the Committee on the Bill that the Corporation of Dublin has consented to the proposed tramways. The proposal of the railway company is to construct tramways from their station in Dublin to the centre of the city, and to enter into agreement with the Dublin United Tramways Co. in respect to the same.

Indo-European Telegraph.—Answering Mr. Lynch in the Parliamentary Papers, Sir Edward Grey stated that the Indo-European telegraph line, which is reported to have been cut by royalist troops between Tabriz and the Russian frontier, is not owned by a British company; but he was informed that the Russian Government, who are more directly interested, have made representations to the Persian Government, and it is proposed to await the result.

First Reading.—In the House of Lords on March 11th, Lord Hamilton of Dalzell presented the Electric Lighting Acts Amendment Bill, which was read the first time.

Corrugation: A Remedy (?) at Last.—We have been favoured with a pamphlet of 16 pp., nicely printed on glazed paper, with several diagrams, and it is borne in upon us that the whole cause of, and remedy for, that malignant rail disease, corrugation, are set out therein. Alas for the mental incapacity of the multitude! The remedy lies here before us; the pamphlet has been distributed widely, yet the world is none the richer, and corrugation must plague us for another while. The truth is painful to us, and will lower us, we fear, in the opinion of our readers, but truth it is, nevertheless, that we found ourselves unable to read more than the first two pages, or to understand two lines. The following *portion* of a sentence may illustrate our difficulty:—

"... with a new rail (if the outer side is not relatively high) the coefficient of friction which obtains in the throat, although subjected to side thrust is unable to raise the wheel in order to bring about the climb and drop, and resembles the man's futile attempt, when, however, the rail has become worn as before explained, the coefficient being the same, the lifting effort of the climb is enabled to raise the wheel from the inner side, the outer side, of course, following and assisting the wheel up, this compares with the man being able to lift the weight when assisted by the spring, in the case of the wheel the lifting effort is entirely dependent on the coefficient of friction between throat and rail, and if this varies suddenly as it does when a rail has commenced to corrugate, and the alternate bright and rough patches have made their appearance where the throat is in contact with the rail it is easy to account for the intermittent action taking place, this will be still easier when it is remembered that accumulated torsion in the axle, and stress in the car frame are present, and ready to assist in breaking down the adhesion in the throat at the bright places, the difference in the supporting power of the throat being that which exists between static and moving friction, it will also be seen that the periodicity of the vibration involves rise and fall of the wheel and its burden, the superior weight of these enables them easily to overcome any periodicity the rail might possess and compel it to synchronise, the resulting periodicity being what we may call corrugation pitch."

No man who wishes to be heard should allow his theory to run such terrible risks. The author must have been at a public school and Oxford to have developed such hatred of the English language, and he must not be surprised if the most earnest tramway man refuses to risk brain fever for the sake of finding out if the latest theory of corrugation is of any more value than the earliest.

HULL CORPORATION SHOWROOM.

The time when it was possible, or permissible, for the managers of electricity works to sit in their offices and receive throngs of would-be consumers has long gone by—if it ever, indeed, existed; nowadays the progressive manager sallies forth to capture customers, and lays plans to attract the notice of the public by utilising every possible means of attaining publicity.

One of the most effective methods of gaining the desired object is that which has been adopted by the electricity department of the Hull Corporation, under the supervision of the city electrical engineer, Mr. H. Bell, to whom we are indebted for the following information regarding this new venture of the Electric Lighting Committee.

The latter has established in a central position a well-equipped and up-to-date showroom and information bureau, of the interior of which a view is given herewith. The showroom is of ample dimensions, and is furnished with the most modern developments in electrical apparatus of all kinds, being probably one of the finest of its kind in this country; care has been taken to avoid overcrowding, and, as will be seen, the apparatus is tastefully and artistically arranged.

It is interesting to notice that, disregarding the short-sighted views of those who still consider the wire lamp an enemy, the Hull Electricity Department has boldly taken it up, and is demonstrating its extraordinary economy as compared with the carbon lamp in this showroom. It is the obvious duty of every municipal trading department to supply the ratepayers with the very best commodities at the lowest remunerative prices; and as the wire lamp gives equal lighting at one-third the energy cost of the carbon lamp, it follows that municipal undertakings are bound to encourage the use of wire lamps. The problem of securing a remunerative income is, of course, a troublesome one to solve, but a progressive policy is the most likely to afford the solution. Ordinary and flame arc lamps, convectors and radiators, cooking and laundry apparatus, and a variety of electric lighting fittings and accessories are shown; there is also an exhibit of electric power applications, including an electric hoist, a portable electric circular saw, drills, fans, motors, &c., which demonstrate to the power-user the extraordinary facility with which electric power can be applied to almost every conceivable purpose. No sales are effected at the showroom, which is intended purely for public interest and instruction, and to afford information to all interested inquirers regarding electric light, heat and power. We hope, and do not doubt, that the new departure will result in a material increase in the load connected to the electricity works.

Electricity Showroom, Hull Corporation.

LEGAL.

Boyd v. National Telephone Co., Ltd.

This action (which was referred to on page 421 of the Electrical Review for March 12th) came on for trial before Mr. Justice Parker in the Chancery Division on Wednesday this week.

Mr. Mark Romer, K.C., for the plaintiff, then stated that the parties had agreed on an order. The defendants submitted to a mandatory order to remove the pole, pay the costs of the action, and repair any damage to the plaintiff's satisfaction. It the parties failed to agree as to the damage, there was to be an inquiry, costs of such inquiry to be reserved.

His Lordship made an order as agreed.

Arc Lamp Patent Litigation.

In the matter of the Patents and Designs Act, 1907, *and re Geo. Braulik's application to revoke Bremer's Letters Patent, No.* 18,786 *of* 1902.

This case came before Mr. Justice Parker in the Chancery Division last week, upon the appeal of the British Westinghouse Electric and Manufacturing Co., the proprietors of the patent, from a decision of the Comptroller-General of Patents (Sir C. N. Dalton), revoking the patent under Sec. 27 of the Patents and Designs Act, 1907. The patent in question, which was granted to Mr. Hugo Bremer, related to electric arc lamps. The terms of the revocation order were fully given in the Electrical Review for February 19th, page 285.

Mr. A. J. Walter, K.C., and Mr. Russell Clarke appeared for the appellants; the Attorney-General and Mr. Sargant for the Board of Trade; and Mr. Bousfield, K.C., and Mr. Gray for the applicant (Mr. Geo. Braulik).

In opening the case, Mr. Walter said that the company's main object in appealing was to get his Lordship to construe the true construction of Sec. 27 of the Act of 1907, upon which no decision had yet been given. The question was one of enormous importance to owners of patents. He thought the question was purely one of construction, and he would deal with it before asking his Lordship to apply his mind to the facts of this particular case. He did not propose to argue some of the contentions put before the Comptroller, for he was satisfied that those contentions were not sound. Primarily, he submitted that Sec. 27 was intended to prevent an evil that had been felt to exist in this country, viz., persons owning British patents whereby they obtained a monopoly in this country being able to sell goods, in respect of which such monopoly existed, which had been obtained abroad. The construction sought to be put upon it was that the section definitely laid down that a person who was the owner of letters patent in this country must manufacture here if he was to retain the monopoly. His submission was that there was nothing in the Act to compel working at all. All it did say was that if you do work and desire a monopoly and sell in this country, you shall make a certain proportion of the goods in this country. He hoped to satisfy his Lordship that in this case the Court was solely concerned with goods manufactured by or on behalf of the patentee or manufactures which result in things manufactured abroad becoming the property of the patentee. The Act had no relation to anything whatever except that, and had nothing whatever to do with any inquiry by a British Court into goods that were made by other persons unless the goods came into this country. He thought the section was a clear and intelligent exposition of what Parliament intended by the Act. He contended that the words "At any time not less than four years and not less than one year after the passing of this Act" clearly showed the intention of Parliament to enable a manufacture to be established in this realm. Under the section any person might apply to revoke a patent on the ground that the patented article or process was carried on wholly or mainly outside the United Kingdom. The words used were "patented article or process." His first contention was that the section could not be read as if the words were "article or process as described in the specification." The patented article was something quite different. It meant an article manufactured by the patentee or his licensee in accordance with the patent, and could not mean an article manufactured by someone else which might be an infringement. The Courts of this country had nothing to do with the manufacture of articles outside this country which never came within the realm, nor, indeed, with the patented article, unless it came within the ambit of the protected monopoly. The object of the section was that the manufacture must not be exclusively or mainly outside the United Kingdom. That, however, had nothing whatever to do with what persons were doing outside the realm. All that this Court was concerned with was the things that were brought into the realm under the ægis of the monopoly. The section had nothing whatever to do with anything except articles manufactured by the patentee or with his consent or licence. That was to say, in ascertaining what was an adequate manufacture, no regard must be paid to anything that was done without the consent of the patentee. If that were not so the circumstances would be very unjust to the patentee. Was it to be said that because a state of things existed which could not be determined until 1911, the patentee was to be deprived of all

monopoly and all right to establish this industry within the United Kingdom? His contention was that the Act did not apply to revoke a patent where the patented article was not brought into this country, and the patented article must be an article manufactured in accordance with the patent by the patentee or his licensee.

The Attorney-General, on behalf of the Board of Trade, said that he should confine himself to general observations on the Act. There were three sections that were material, and a common purpose seemed to run through all. Those sections were 24, 27 and 38, and his submission was that in the first instance it was the intention of the Legislature to protect the patentee to whatever extent was necessary to enable him to reap an adequate reward from his invention, but as the patentee's reward was secured to him by a monopoly, a grave danger might ensue, and, in fact, did ensue, if that monopoly was used for purposes that went beyond the taking of a reasonable reward. The patentee was able to get collateral and improper advantage beyond his monopoly. The object of the Act was to prevent that. It was found that the monopolist was not content with getting an adequate reward, but was, in some cases, treating his customers as a brewer treated a bad house. Sec. 38 was to prevent that. The whole scope of the Act was to prevent a monopolist acting in restraint of trade. That was no new doctrine, but the common purpose running through all the sections was an ancient doctrine of common law. If an article patented in this country was manufactured entirely outside the United Kingdom, it was thought that the requirements of the public would not be fairly and adequately met. English customers would not be getting the benefit of the English patents, but would have, for instance, to pay in addition to the fair cost of the article, the cost of transport. The Act was really for the benefit of the public, and it was in that light that the Courts had to construe it. Whenever a patented article was manufactured outside the United Kingdom, there was an inequality, and that inequality the Act sought to remedy. The Briton must not be put in a worse position in getting the article than the foreigner. That was the basis of the Act. Parliament had said that it would not allow the monopoly granted to be used in such a way as to give the foreigner an unfair advantage over the Englishman. What Sec. 27 intended to say was, that if you are granted an English patent you shall manufacture the article in England as an Englishman would manufacture it, so as to give England the benefit of a local supply, and you shall not manufacture it abroad in a way that would enable you to restrict the market. The user of the English monopoly must be of a character beneficial to the public, and it must be exercised under circumstances that would ensure the public getting the greatest possible benefit out of it. There could be no reasonable doubt of the jurisdiction of the Court to take into consideration all the circumstances. That was why the word "satisfactorily" had found its way into the Act. It had put great power into the hands of the Court, which Parliament never would have done if that power was not to have been judicially controlled.

Mr. Bousfield, for the respondents, contended that if the article was manufactured or imported under the ægis of the patent it was, *prima facie*, the patented article or manufactured by the patentee under the patent. It did not matter whether the articles came into this country from the company in Germany or the Westinghouse Co. in America. The broad principle was: Are you, the patentee, going to do the work in this country? If you don't work your patent in this country, then it goes.

His Lordship said he should give Mr. Walter the opportunity of calling further evidence on behalf of the appellants if he desired to do so. He thought the appellants should have that opportunity, and the applicant should formulate the reasons upon which he relied.

Mr. Walter remarked that he was delighted to hear his Lordship say that.

His Lordship said that it appeared to him on the construction of the Act, that until it was proved that the main manufacture was abroad, there was no duty cast upon the patentee at all.

Mr. Bousfield: The Act says any person may apply to the Comptroller for the revocation of a patent.

His Lordship: The Section says, "Shall consider the application."

Mr. Bousfield said that the rules were made by the Board of Trade. Rule 79 said "The patentee shall within 14 days from the delivery of such copy (copy of the application), or within such further time as the Comptroller may allow, leave at the office, evidence by way of statutory declaration, stating whether or not the allegations contained in the application are correct; and if they are incorrect to what extent, and in what place the patented article is manufactured or carried on in the United Kingdom . . ." What the Comptroller had to consider was how many of the patented articles were made abroad, and how many in this country, and the patentee had to make a statement on oath as to which was correct. It was, no doubt, inquisitorial, but it was the only way to carry out the Act.

His Lordship: Does it not seem rather hard that you should put the patentee upon the rack before you prove anything?

Mr. Bousfield: Yes; but it seems very hard that a foreigner should get hold of a British invention and work it abroad to the detriment of our workpeople. Unless the Board of Trade could get evidence, it would be impossible to put the Act into operation.

His Lordship: I don't see how you can shift the onus of proof.

Mr. Bousfield said that the patentee had first of all to show that the allegations of the applicant were incorrect, and to what extent and in what place the patented articles were manufactured in the United Kingdom, and if not so manufactured to an adequate extent, stating the reason why Parliament was entitled to throw upon the patentee the onus of showing that he was carrying on a substantial manufacture in the United Kingdom.

His Lordship: That is precisely what the Act does not say. This rule would give the right to any trader to get at the books of every other trader in the country.

Mr. Walter: That is precisely what has been done in the present case.

Mr. Bousfield said that the object of the Act was to stamp out these patents which were being worked abroad, and not in this country. If they were not going to make the Act a dead letter, they were bound to have such a rule as that in question.

Mr. Walter said that at the present time there were 27 of these petitions pending, for not one of which was there the slightest foundation.

His Lordship said he thought the case ought to be adjourned to give the petitioner the opportunity of formulating his reasons.

Mr. Bousfield suggested that both sides should make declarations.

Mr. Walter did not at all mind putting in an affidavit, because it might be that when the petitioner saw them he would see he had started on a hopeless task.

In the result the hearing was adjourned for further evidence to be filed, and it will probably be again before the Court after the Easter vacation.

Blackwell & Co. *v.* Mayor and Corporation of the Borough of Derby.

In the Court of Appeal on the 11th inst., Lord Justice Kennedy and Mr. Justice Joyce had this case before them.

Mr. J. R. Atkin said that this was an appeal by the plaintiffs, a firm of electrical engineers, against an order of Mr. Justice Bucknill in Chambers, staying the action on the ground of an arbitration clause in the agreement between the parties. It involved a question under a contract for making an electric tramway in Derby. In the contract there was a very elaborate arbitration clause referring all disputes to the borough engineer of the Corporation. That gentleman had certified for certain penalties. Plaintiffs were suing for a balance due under the contract, and their case was that the alleged delay for which they were penalised was caused entirely by the acts of the borough engineer himself, who had ordered the plaintiffs to do certain things in certain ways, and obtain materials from certain firms. Plaintiffs contended that the delay was caused by the engineer's own conduct, and they made an attack upon his *bond fides*.

Lord Justice Kennedy said he had heard that this was a case which raised very much, if not exactly, the same point as was being raised in the case of William Kennedy, Ltd., *v.* the Mayor and Corporation of Barrow-in-Furness, which was under consideration by the Court of Appeal differently constituted. In that case there was a question as to whether there should be a reference under an arbitration clause to an engineer whose conduct was said to have brought about the state of things. It was urged upon the Court in that case that they would have to decide under what circumstances, if any, such matters should affect the arbitration clause. He, therefore, suggested that it would be better if the present appeal stood over until the parties had the advantage of knowing what had been done in the Barrow case. Of course there might be distinguishing circumstances between the two cases.

Mr. Atkin agreed as to the advisability of the present appeal standing over, stating that he would have to cover very much the same ground as had already been covered as to the law in the Barrow case.

Lord Justice Kennedy remarked that the course he proposed might save the labour and expense of arguing the present appeal.

Mr. Etherington Smith, for the Corporation, said that after the remarks which had fallen from his Lordship, he would not stand in the way of the case going over as suggested. Of course, each of these cases depended upon their own particular facts, the question being whether those facts fitted the principles of law which had been laid down in three or four cases.

It was arranged that the case should stand over till after judgment had been delivered in the Barrow case.

"Z" Electric Lamp Manufacturing Co. *v.* Zossenheim.

The motion by the plaintiffs in this action (the title of which was incorrectly given last week as "Zend" instead of "Z") for an interim injunction to restrain an alleged infringement by the defendant of their patent for electric lamps, was again before Mr. Justice Parker in the Chancery Division on Friday last.

Mr. Colefax, for the plaintiffs, said that the defendant was served with notice of motion and copies of the evidence in support six days before the motion came on on the previous Friday. It had stood over to give the defendant an opportunity of answering the evidence on his undertaking to keep an account and to file his evidence by Wednesday last. He had not filed any evidence, but

was now represented by Mr. Gray, who asked that the motion might stand over for another week. He (Mr. Colefax) submitted that under the circumstances the plaintiffs were entitled to the injunction for which they asked.

Mr. Gray submitted that there should be a further adjournment. The defendant, he said, was an agent for a German company, and the delay had arisen through the necessity of communicating with Germany. What was complained of had been going on for upwards of 2½ years, and he knew of no case where the Court would grant interim relief in such cases.

Mr. Justice Parker said perhaps not when there was a *bona fide* dispute as to the validity of the patent, but injunctions had been granted under such circumstances. He thought, however, if the defendant wished to answer the evidence filed against him he should have an opportunity of doing so. He suggested that the motion should stand over for another week on the same undertaking as before.

Mr. Colefax said these lamps were quite new, and the invention consisted of the substitution of a metal substance for the carbon. He must press that if the motion did stand over the evidence for the defence should be filed, so that the motion might be effective for next week.

After some further discussion, his Lordship directed the motion to stand over until Friday, the 19th, upon the defendant continuing his undertaking to keep an account and to file such evidence as he intended to use, by Wednesday if possible.

North-Eastern Steel Co. *v.* R. W. Blackwell & Co., Ltd.

In the Court of Appeal, before Lord Justice Kennedy and Mr. Justice Joyce, the case of the North-Eastern Steel Co. *v.* R. W. Blackwell & Co., Ltd., electrical engineers, was in the list for hearing on an appeal by plaintiffs against an interlocutory order made by Mr. Justice Hamilton in chambers.

Mr. Scott Fox, for the appellants, asked that the matter might stand over with a view to a settlement.

Mr. J. R. Atkin, who appeared for the respondents, agreed.

Their Lordships directed that the case should stand out of the list till the 18th inst.

Overhead Lines—Prosecution by the Board of Trade.

At Sittingbourne, on Monday, the Sheerness and District Electric Power and Traction Co., Ltd., were summoned by the Board of Trade for having overhead lines for carrying electric power otherwise than according to the plans approved of by the Board of Trade. The case was the outcome of a fatal accident owing to a person taking hold of a live wire. The offences were admitted, and the company was fined £10 for the first day, and 10s. for each subsequent day from October 10th until November 5th, no order being made as to costs.

Re The Electro-Peat Coal Co.

The hearing of this case was resumed on Thursday last week, when it was stated that Earl Mayo was better, but still unable to give evidence, so that the case was resumed with the evidence of the other defendants.

Mr. John Macgregor said he was managing director to Messrs. Johnson & Phillips, the well-known electrical engineers, whose works were at Charlton. The peat coal process was first introduced to him in 1903-4 by Mr. Bowden and Mr. Carmichael. He was asked to make some experimental machinery, and he did so. In November, 1903, a demonstration was given at the works, and after the results were published, people came from all parts of the globe to see the product. His firm used some 3,000 tons of coal annually, and they tried the peat coal and found it excellent for grates, while the foreman of the welding department said he would sooner use it than ordinary coal, owing to its freedom from sulphur and its intense heat. Peat coal could also be made in any shape, and was therefore suitable for ships or places where space was valuable. It also gave only a little ash and no clinker. He did not underwrite any of the shares, and was not aware that any of the prospectuses were being used for underwriting purposes. He signed one draft prospectus about January 18th for submission to counsel, and one for filing on April 15th or 16th, but he authorised no one to use them for showing to anyone. The estimate he made of 9s. a ton as the selling price of peat coal, he honestly believed was a fair one, and was based on the belief that works would be put up in districts where coal was scarce, and where dried peat fuel was sold at 15s. to 18s. per ton. He was present at the meeting where the allotment took place, and the allotment was made on the assurance of Mr. Fox, the solicitor, and the secretary, Mr. Kelly, that everything was in order.

Cross-examined by Mr. R. Isaacs, Witness admitted that he was aware it was the duty of directors to see that the statements in a prospectus were true, but it was the first allotment he had been at and he did not understand it. He relied on statements made by the solicitor and the secretary, that all was in order. He was aware that at one time there was discussion going on as to the name of the process in the electrical papers, and he saw both the *Electrician* and the Electrical Review, but the directors had confidence in Mr. Scoones, who was an eminent engineer. He believed, if the company had got enough capital to properly demonstrate the process, they would have been able to get any quantity of support.

On Friday, Sir L. Falkiner was put into the box and taken *seriatim* through the whole of the matters dealt with in the examination of the other witnesses. He said he never authorised any prospectus but the one of April which was issued to the public, and he never authorised anyone to use it for underwriting purposes. He still believed in the commercial future of the process, and said that but for this action the thing would have been all right. In cross-examination he denied that he ever met Mr. Darlington Simpson or had business with him before Capt. O'Kelly, a friend, introduced them in relation to the Peat Coal Co.'s affairs in November, 1903. He honestly believed all the statements in the prospectus, and denied that he ever intended to defraud anyone by anything he did in connection with the company. He admitted presiding at the allotment meeting, but said he was assured by the officials, the solicitor and secretary that everything was in order, and the directors fully relied on these people.

On Monday, Sir Leslie Falkiner was further cross-examined by Mr. Isaacs. He said he did not know that Col. St. Quintin was interested in the promotion of the company before the prospectus was issued. He probably saw a statement in the prospectus that Col. St. Quintin was interested in the syndicate, but it did not make any impression on him. He was away yachting in the Mediterranean when the prospectus was submitted to counsel, and he assumed that everything would be done in order. He did not think much about intricate matters which he did not understand. He never saw Mr. Scoones's original report, and never learned until this case came on that Mr. Scoones had altered his calculations. He did not go about thinking that everybody he met was a rogue. He did not remember reading counsel's opinion. He was told by Mr. Darlington Simpson that it was all right, and he accepted it.

Did it ever occur to you that it was desirable to exercise some check on the statements of the promoter of the company?—Yes but there were other directors who had been looking into things while I was away.

Do you mean you left it to them?—In a sense, I suppose; but I was trying to do my little bit as well. I did my best according to my lights, and no one could do more.

Does that mean you were relying on them?—Yes, to a great extent; in fact, entirely.

Further questioned, he said he could not help thinking that Mr. Harland, the eminent chemist, was not acting *bonâ fide* when he wrote a letter to the financial papers criticising Mr. Scoones's report. If Mr. Harland had gone to him instead, all this trouble might have been obviated. He did not think that any public answer was ever made to Mr. Harland's letter.

In re-examination, he said Mr. Pearson's application for 10,000 shares was on notepaper, containing the heading and addresses of electrical engineers at Burnley and Manchester, and as this was an invention which particularly appealed to electrical engineers, the directors had no reason to suppose that Mr. Pearson was out of his mind at the time. Witness still had faith in the invention, in fact, if anything his faith in it had increased. He had done all he could to make the company a success.

Lord Mayo was next examined, and in reply to questions from Sir E. Carson, said there was no truth in the charge that he issued statements in the prospectus, knowing they were false. He trusted the auditors, who were able and trustworthy men, in the report they made as to the financial condition of the company. He made no representation to Mr. Barker, the plaintiff, and did not authorise anyone to do so.

Cross-examined by Mr. Isaacs: It did not occur to him that his name on a prospectus would attract people to take shares. He had never appraised the value of his name on a prospectus. Pressed on this point, witness said Mr. Isaacs might put it as nastily as he liked, but he would get no other answer. Asked whether he got an invitation to go to a directors' meeting, witness replied that he did not go by divine inspiration. He took the usual steps to verify the statements in the prospectus, viz., sent them to counsel and the solicitor of the company. He knew there was underwriting to be done, and was aware that there were syndicates flitting about like moths round a candle, but he had "nothing to do with the blooming thing." He had nothing to do with the underwriting, and he took the report of Mr. Scoones with a grain of salt, for he had heard experts contradict one another till the atmosphere was quite thick.

On Tuesday the cross-examination of Lord Mayo was resumed by Mr. Isaacs. He could not say if he had seen the underwriting letters, but he might have done.

Great amusement was caused in the course of the cross-examination, when Mr. Isaacs said he wished to get an answer to a question in order to draw an inference thereon, by Lord Mayo saying, "Oh, now you want to lead me into the barren fields of elusive hypothesis." He admitted the company had spent a good deal of money on machinery, and the money that was taken in sales was credited to the cost of labour at the works. Simpson told him that he would show him the underwriting letters, but he never did so, and, in fact, witness had nothing to do with the underwriting. He tried to get all the information he could, but Simpson put a great deal of difficulty in the way. In fact, Simpson wanted to be a director, but witness would not have him at any price. He maintained that as chairman of the company he had done all he could in the interests of the shareholders. He failed to see now, after Mr. Isaacs's cross-examination, in what way he had defrauded anyone. He had the fullest confidence in Mr. Scoones and Mr. Hales, the experts, and he had no reason to think that they and Mr. Simpson, the promoter, were not honest men. The prospectus of January 20th was never seen by him, and he had nothing to do with the document shown by Bowden to the plaintiff on which he subscribed for shares.

Col. T. Austell St. Quintin said he was a brother officer with the Earl of Mayo in the 10th Hussars, and knowing Lord Mayo was much interested in the industries of Ireland, he introduced the matter of the Peat Coal Co. (which was brought to witness by Mr. Simpson) to his Lordship. Witness said he thoroughly believed in the process, and thought that if the peat coal was burned properly it was quite equal to coal. He never authorised the prospectus of January 20th to be issued to the public, nor to be shown by Bowden to plaintiff or to anyone else. He believed that the Bessey electrical process made the best peat coal in the world.

(To be continued.)

BUSINESS NOTES.

Consular Notes. — Spain. — The German Consul at Seville, in a recent report, states that large quantities of electric motors and similar technical materials for electrical installation work are imported into that district. All these articles are chiefly imported from Germany, the products of that country being cheaper and the terms of payment easier. Incandescent electric and arc lamps are imported almost exclusively from Germany, and in recent times metal-filament lamps have also been imported from that country. Exact details as to the percentage of trade held by Germany are not, however, available, as the Customs House returns do not specify these separately. The incandescent electric lamp works erected some few years ago have not been a success, probably owing to the inefficiency of the staff, and have not been able to compete with other works. The owners of this well-appointed factory propose to sell it to a foreign house. It could well be used for putting together parts of lamps manufactured abroad. As the duty on the finished lamp is very high, it would be possible to obtain considerable profits by working in this manner, particularly in the production of metal-filament lamps, which begin to be very popular.

Russia.—The German Consul at Vladivostok states that whereas formerly none of the few larger towns of the Amur Government had been supplied with electric light, in 1907, Habarowsk and Blagowestchensk were supplied with such light and Vladivostok with a telephone system. A beginning was made in Habarowsk, where a lighting plant was erected in the second half of 1906, and was set working in the beginning of 1907. Then followed Blagowestchensk, where building was begun in August, 1907. In Vladivostok the telephone service was begun in May, 1907, and was finished in October of the same year. The municipality of Vladivostok has been in negotiation with various German firms for the erection of an electric light station and electric tramway in the town, and the rails for the electric tramway have already been imported.

The German Consul at Kieff reports that considerable numbers of petroleum engines are imported, these being installed on wagons built in the country, thus constituting a kind of locomobile. It is found that it is cheaper to work this way than to import the whole complete from abroad. The sale of naphtha motors, on account of the rise in price in naphtha, has decreased. The demand for engines is supplied almost exclusively from Germany, although the manufacture of suction gas engines in the country has already been begun; but these engines are not as yet very popular in the district. The imports of boilers are chiefly from Great Britain and Germany, but boilers are also manufactured in the country; the most favoured system is the water-tube boiler. The demand for simple machine tools of foreign origin is almost nil, since the high import duty favours the manufacture of these goods in the country; machine tools of more complicated design are, however, imported from Germany and America. Machine tools of German origin, owing to their cheapness, have almost ousted from the market the machine tools made in Great Britain, which were formerly very popular. Attempts made by Austria-Hungary to gain a footing on the market have been almost fruitless. The demand for transmission belts is chiefly for leather belts (60 per cent.) and camel-hair belts (30 per cent.); balata belts show 9 per cent., and cotton belts 1 per cent. Leather belts of British origin have almost disappeared in favour of German goods. In camel hair belts, too, Germany finds a good market, although British belts are preferred. One of the most important British firms, which has a branch in Russia, has a large warehouse in Kieff. In balata belts the foreign product has to give way to the home manufacture.

Italy.—The Minister of Public Works has in course of consideration a project for an electric railway from Terano to Bormio. The line has a length of 39·4 kiloms, and passes through Bolladoro. At present communication is effected by means of an automobile service. The importance of the new line is the facility of communication which it affords with important health resorts in the Tyrol and the Val Monastero.

A meeting has been held at Modena for the purpose of arranging for the construction of an electric railway from Vinola to Guiglia and Zocca, which will establish communication between Modena and the last two towns. The line will have a length of 25 kilometres. There is at present in existence an automobile service between these towns which occupies two hours between Vignola and Zocca and one hour to return from Zocca to Vignola. The new line will have an average gradient of 23 36 in 100. An application had been made to the Minister of Public Works for a concession for the construction and exploitation of this railway. The average gradient will be 27 in 1,000, and it is estimated that the cost of construction will be 8,000,000 lire.

The Marchese Rusconi Cav. Aldo is forming a company at Spezia with a capital of 2,300,000 lire to construct and work a tramway lina from Spezia to Alta Lunigiana. The title of the company is the Societa Anonima Elettro-Industriale della Valle del Rosario, and the headquarters will be at Spezia.

Hungary.—The agents of the Ganzsche Elektrische Fabrik, Herr Ripka and Ingenieur Zaharra, are negotiating with the municipality of Hajdubossormeny with a view to erecting an electric station in that town. The project of the Ganzsche Fabrik is to form a company with a capital of some million kronen to erect works for the supply of electric energy for lighting and power purposes to the towns of Hajdubossormeny, Dorog and Nanas.

Plans for the erection of electrical works at Bekes for lighting and power purposes have now been prepared, and it is anticipated that tenders will soon be invited.

Palestine.—The new political *régime* in Turkey is opening up new possibilities for the electrical industry in Palestine. A Turkish company established in Jaffa have secured a concession for the construction of an electric tramway in Jerusalem, for the installation of works for lighting and power purposes, and for the construction of an electric railway between Jaffa and the outlying agricultural districts.

Book Notices.—*Electricity, Present and Future.* By Lucien Poincaré, translated by Jasper Kemmis. London: Sisleys, Ltd. Price 7s. 6d. net.—This treatise will be found useful by both engineers and students. The writer discusses in an interesting manner magnetism, induction, dynamos and motors, transmission of energy, chemical and electrical energy, and electric lighting. The author has a thorough knowledge of the physics underlying the questions he discusses, and without using mathematics, makes the matter clear. The portion of the book dealing with magnetism seems most attractive as a *résumé* of work done. The book is a peculiar one in this respect, that scientific principles and practical applications are discussed, and the directions in which progress may be looked for outlined. Regarding the "Cooper-Hewitt" system of lighting, he says, "it is also true that this light, which is very soft and restful, has a good effect upon the temper, but this moral advantage hardly suffices to ensure the success of the mercury arc lamps." The reviewer is afraid that the light from the mercury vapour lamp has *not* a good effect upon the temper, the cold, greenish light being most uncomfortable. The author ends this treatise of some 300 pages by quoting the remark of Aristotle, viz., "When the shuttle can work totally unaided, we may perhaps put a stop to slavery, not before." The author writes: "Moved by the energy that science has learned to control, the shuttle will work under the keen and intelligent direction of a man upon whom the burden of servitude will no longer weigh, and in the moral, as well as in the economic, sphere of life, electricity will have been the great liberator." The work is well printed, and the only error noticed is on page 28, where "luminous ether" is used instead of "luminiferous ether."

Spanish and English Technical Terms. By R. D. Monteverde, B.A. London: Crosby Lockwood. Price 2s. 6d. net.—This is a neat little waistcoat pocket glossary of technical terms occurring in the engineering, manufacturing and mining industries. Both English-Spanish and Spanish-English divisions are given. As the author says, in a work of this nature, there is not much scope for originality; but we believe there is certainly room for this handy glossary, which is admirably produced, and we can recommend it to our readers, with the comment that too little attention is given to the enormous possibilities of trade with the Spanish-speaking races, and to the importance and value of a working knowledge of Spanish—perhaps the easiest of all languages to learn.

"Transient Electric Phenomena and Oscillations." By C. P. Steinmetz. New York: McGraw Publishing Co. 1909. Price $5 net.

"Practical Calculation of Transmission Lines." By L. W. Rosenthal. New York: McGraw Publishing Co. 1909. Price $2 net.

"La Materia Radiante e i Raggi Magnetici." By A. Righi. Bologna: N. Zanichelli. 1909. Price L.8.

Trade Announcements. — The Traction Supplies Co., Gill Bridge Avenue Electrical Stores, Sunderland, announce that they have appointed as general manager Mr. Alfred White, who has been for many years connected with the electrical engineering and contracting trade in Sunderland and district. They are representatives for Planiawerke carbons and Wright and Wood's motors in Northumberland and Durham, also for general supplies, cables, &c. We understand that they have a specially equipped workshop for the manufacture of special electrical spare parts, patented watertight switches, registered connectors, sockets, mechanical bells, &c., and will do wholesale business only.

The Century Electric Co. have removed to 14, Brown Street, Manchester, fronting the G.P.O.

The well-known firm of Max Kohl, Chemnitz, has been formed into a share company under the style of Max Kohl Aktien-gesellschaft, with a capital of M. 1,600,000.

The Crypto Electrical Co., of 155 and 157, Bermondsey Street, S.E., inform us that owing to increased business they have had to make considerable extension to their factory, and have secured the building adjoining their present premises; this, after alterations, they have now opened as an extension to their workshop, enabling them to handle orders more promptly. This is the third extension within five years.

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Messrs. Davis-Perrett, Ltd., makers of electrical oil eliminating patents, have removed to Caxton House, Westminster, S.W.

The offices of *Page's Weekly* has been removed to Lennox House, Norfolk Street, Strand, W.C.

A branch office of the London supply department of the British Westinghouse Electric and Manufacturing Co., Ltd., has been opened at 27, Chancery Lane, W.C., in the showrooms of which is displayed a fine assortment of Westinghouse flame and enclosed arc lamps, metal and carbon-filament lamps, electrical fittings, fans, conduits, cables, telephones, bells, small motors, accessories, &c. Inquirers for such electrical accessories should therefore substitute the above address for the old one, 2, Norfolk Street, W.C. The telephone number remains 3261 Gerrard, and the telegraphic address is "Westelec, London."

Eureka Conduits and Fittings Co., of Walsall, have appointed Messrs. Hogan & Wardrop, of Gloucester Mansions, Cambridge Circus, as agents for London and district for the sale of their conduits and fittings. A stock will still be maintained in London.

Fire.—A fire occurred on Friday last on the premises of Messrs. Brewer & Brunt, electrical engineers, Market Place, Hoylake. A good deal of stock was damaged.

Liquidation.—Reed's Electrical Co., Ltd.—A meeting is to be held at 90, Cannon Street, E.C., on April 19th, to hear an account of the winding up from the liquidator, Mr. D. S. Fripp.

Catalogues and Lists.—Mr. G. Braulik, 8, Lambeth Hill, London, E.C.—Two new catalogues, one giving illustrated information and prices of ironclad switchgear (starters, circuit breakers, rheostats, &c.), the other being devoted to arc lamp couplings and brackets.

Messrs. J. P. Hall & Co., Ltd., Blackriding Ironworks, Werneth, Oldham.—New 32-page 1909 price list of dynamos, some of their machines being boldly illustrated. Descriptive and general specification particulars of open-type multipolar generators are followed with full tabulated details regarding speeds, prices, dimensions, weights, and code words. A very wide range of machines is listed, including four, six, eight, and ten-pole dynamos, and for the convenience of customers abroad, every output and speed has a separate code word. We are asked to draw our readers' attention to the fact that the company is not connected with firms bearing similar titles. All communications should be addressed as above.

Messrs. Wright & Wood, Ltd., Century Works, Halifax.—List No. 25 illustrating and giving prices of their small alternating, two and three-phase induction motors, and continuous-current motors up to 5 h.p. Buffing motors for polishing work in jewellers and other trades are shown. Copies of the list will be forwarded on application.

Messrs. Siemens Bros. & Co., Ltd., Caxton House, Broadway, S.W.—Catalogue No. 37 giving full particulars concerning their dry cells and dry cell batteries, dealing largely with the Siemens Obach dry cells for ignition purposes. The Dura dry cells are also priced and particularised.

The Sterling Telephone and Electric Co., Ltd, 200, Upper Thames Street, E.C.—Leaflet giving a list of reduced prices just announced for telephonic apparatus and accessories.

Messrs. British Insulated and Helsby Cables, Ltd., Prescot.—New leaflets have been issued as follows:—P. 84, giving a list of the chief cable contracts at 5,000 volts and over, executed by the company; P. 85, Prescot fault-localising apparatus; P. 86, laying extra high-tension feeder cables for Moscow tramways; P. 87, Prescot feeder and distributor pillars (colliery type); L. 35, telephone switchboards.

Messrs. Wm. Wadsworth & Sons, Bolton.—Neat 32-page catalogue describing their modern lifts and hoists, which include patent electric lifts for all classes of service.

The Cowper-Coles Galvanising Syndicate, Ltd., 82, Victoria Street, S.W.—Eight-page illustrated pamphlet describing improvements in galvanising—the Cowper-Coles regenerative electro-zincing process. The company inform us that they have work in hand for Government contractors, and that there is a rapidly increasing demand for electro-zincing wire, as the temper, it is claimed, is not lowered, nor the strength impaired, as with hot galvanising.

Private Meetings.—Arnold Roberts, trading as Roberts Bros., North Parade, Bradford, engineers and electricians.—The creditors were called together last week, when a statement of affairs was presented showing gross liabilities amounting to £2,290. The assets were estimated to realise £1,134 10s., a deficiency being thus disclosed of £1,156. The assets were as follows: Book debts, £235, expected to produce £200; stock-in-trade, £357, estimated to realise £300; loose plant, shop fittings, &c., £150; work in progress, £581, valued at £500; and household furniture, £50. The liabilities included a sum of £348, which was due to a relative of the debtor's for cash advanced at various dates, and there was also a bank overdraft amounting to £550. The bank, however, held collateral security for the whole of their claim. The debtor had a contract in hand for the Bradford Corporation, the total price being £1,420. So far he had spent over £1,000 on the work. He had received £550 on account, and a further sum was about due. It was estimated that this particular contract would cost about £350 to complete. The debtor had been trading for himself since 1902, and for the 18 months ended May, 1904, the turnover was a little over £2,000, on which he made a net profit of about £200. During 1905 the turnover was £1,400, while during the following 12 months it was £2,029. In 1907 the turnover was £1,740, while last year it was £1,860. For the nine months ended February 28th last, the turnover was £1,690. During 1906 there was a net profit of nearly £300, but since that time the trading had not been so successful. The debtor only acquired his present premises towards the close of 1907, and he spent a sum of £300 in fitting them up. His drawings had only been at the rate of £2 10s. weekly. After discussing the position disclosed, it was resolved to accept a composition of 5s. in the £, payable in one month, or 7s. 6d. in the £, payable by instalments at four, eight and twelve months, the last instalment to be secured. As further security, it was decided that a deed of assignment should be executed. A committee was also appointed, consisting of the representatives of three of the principal creditors.

Reduction of Capital.—Engineering Instruments, Ltd.—A petition has been presented for reducing the capital from £50,000 to £31,562 by cancelling lost capital, by reducing 15,000 ordinary shares from £1 each to 10s. each; and 12,500 deferred of £1 each to 2s. 6d. each. All ordinary shares are to be sub-divided and of 2s. 6d. each. The above deferred shares are to be converted into ordinary shares.

Amalgamation of German Copper and Cable Works.—The directors of the Heddernheim Copper Works, formerly F. A. Hesse Sohne, of Frankfort-on-the-Main, and of the South German Cable Works Co., of Mannheim, have decided to proceed with a scheme of amalgamation of the two undertakings, subject to the approval of forthcoming meetings of the shareholders. It is proposed for this purpose to transform the £50,000 of priority shares in the Heddernheim Co. into original shares and to increase the ordinary capital from £250,000 to £400,000, the £150,000 in new shares to be exchanged for the £150,000 of ordinary share capital of the South German Cable Works. The title of the combined undertaking will be the Heddernheimer Kupperwerk und Suddeutsche Kabelwerke, with headquarters in Frankfort and a branch at Mannheim, and nearly all the directors of the cable manufacturing company will become members of the board of the amalgamated enterprise. As to the reasons which have prompted the scheme, it is mentioned that the Frankfort Co., in addition to producing manufactures of the copper, brass and metal industries, also turns out copper wires on a large scale for conductors. On the other hand, the cable company has hitherto been compelled to purchase copper and copper wire for working up into cables, insulated conductors, strands, &c. The combination consequently has a closely associated and natural basis, and aims at the prevention of further unnecessary competition between the two undertakings, which would have arisen if the Frankfort Co. had established a cable factory and the Mannheim Co. had erected rolling and wire-drawing mills.

Smoke Abatement Exhibition, Sheffield.—At this exhibition at a stand arranged by their local branch, Messrs. Siemens display a number of electrical exhibits, including the following apparatus:—Small c.c. and a.c. motors; brake magnet for cranes; 100 h.p. mining pillar; motor starting panel; automatic two-phase lift controller; breast drill; grinder; tantalum holophane arcs and other fittings; ohmmeter and generator; complete sets of Obach and Hellesen dry cells; a selection of motor-car accessories, including spark plugs, electric horns, &c.; electric resistance, thermo-electrical, water and optical pyrometers, &c.

Contemplated Work on Public Buildings.—The estimates for the Civil Service for the year ending March 31st, 1910, include the following votes for contemplated work:—Completion of installation of electric lighting and heating at Hampton Court Palace, £500; additional electric mains to plant house at Edinburgh Botanic Garden, £130; supply of electric current to Houses of Parliament, £4,000; alterations in connection with the supply of electric light to House of Commons, £340; installation of electric light at Boston County Court, £330; installation of electric light at Clerkenwell County Court, £320; completion of original scheme for installation of electric light in Natural History Museum, £500; substitution of electric for hand lift at Royal Scottish Museum, £750; supplying new arc lamps in Great Hall and Natural History Section of the Royal Scottish Museum, £220; alteration and revision of electric lighting circuits at diplomatic buildings, Athens, £450; electric light installation for State Rooms and Chancery at The Hague, £2,300; installation of electric light and bells at Newchang Consular buildings, £160; extension of electric light at diplomatic buildings at Pekin, £500; electric light installation in Embassy Compound and students' quarters at Tokio, £350; electric light installation in offices at Yokohama, £100; installation of electric light at Weymouth Customs House, £150; rearrangement of electric power cable and switchgear at Somerset House, £250; installation of electric light at Newcastle-upon-Tyne Inland Revenue buildings, £250; new power station at Blackfriars for Post Office, £4,000; parcel office and telephone exchange enlargement at London Western District Office, £8,270; new telegraph stores at Birmingham, £13,620; introduction and extension of electric light in several public buildings, £3,500.

LIGHTING and POWER NOTES.

Aberdeen.—The Corporation Electricity Committee has considered a recommendation that Sir Alex. B. W. Kennedy, F.R.S., be consulted on the question of the system of charging, and also on the rates to be charged in carrying out the system. Before coming to a decision, the Committee agreed first to consider certain statistics prepared by Mr. Bell, the electrical engineer.

Argentine.—A large generating station is being erected by the German Electric Light Co. at the Dock Sud, Buenos Ayres. Messrs. Philip Holzmann & Co. are carrying out the work, and the station will have a capacity of 130,000 H.P. The construction of an electric lightingistation at Saladillo is also shortly to be commenced.

Aspull.—The U.D.C. is to transfer its prov. order to the Lancashire Electric Power Co. for £250, with powers to repurchase after 28 years.

Australia.—The Sydney Council has engaged Major Cardew (of Preece & Cardew) to report on the electric supply system, at a fee of 1,500 guineas. The capital expenditure at December, 1908, amounted to £419,035, £180,000 is being expended on work in hand, and an additional £10,000 will be required for mains extensions.

Barnes.—All electric street lamps fitted with the Nernst burners in main thoroughfares and important positions are to be refitted with 100-C.P. metallic-filament lamps.

Brazil.—The electric lighting of the city of Joinville, which has been installed by Messrs. Behrend Schmidt, was inaugurated by the Governor of the State. The water power employed is at Pirahy, which is 300 metres above sea-level, whilst the transmission lines are carried for a distance of more than 20 km. Messrs. Behrend Schmidt are the representatives in Brazil of the A.E.G., and they have already installed electric light in no less than 12 cities in that country. The available horse-power at Joinville is 2,100.—*Brazilian Review.*

Brighton.—The electrical engineer has reported to his Committee as to probable extensions during the next few years. Between 1910-11, a fifth turbo-generator will be required at Southwick, the estimated cost being £12,500; further transforming plant will also be required at the North Road station between 1910 and 1912, and this will necessitate an expenditure of £5,250. A second 300-KW. motor-generator, to cost £1,500, is urgently needed at the Southwick station. The unspent balance of the loan sanctioned in January, 1907, is estimated to be sufficient to cover the requirements in mains, motors, meters, &c., during the next two or three years.

Bury St. Edmunds.—The T.C. has decided to install an additional engine and 200-KW. dynamo, at a cost of £1,500, and to extend the mains at a cost of £655.

Canada.—A large hydro-electric development is being attempted at Grand Falls, New Brunswick. Grand Falls are situate 200 miles above St. John, on the St. John River, which is the largest in New Brunswick. The Falls describes a horse-shoe curve at this point, and have a fall of 135 ft. Its utilisation, like that of Niagara, will result in a great increase in industrial activity in the province. The contract for the construction work has been let; the plant will generate 100,000 H.P., which will be furnished to the various towns and cities throughout New Brunswick and the State of Maine, the Falls being only 2 miles from the international boundary.

Colchester.—Last week we referred to the proposal to supply the Hythe district with electrical energy, utilising the existing overhead tramway trolley wires as feeders. Prior to this a feeder main had been proposed at a cost of £2,470, which was considered excessive; later, Messrs. Mordey & Dawbarn recommended the provision of an overhead feeder cable carried on the existing tramway poles, at a cost of £675. This was submitted to the B. of T., who, as might be anticipated, decided against the proposal, the reason stated being, that the feeder would be of considerable size, and of a permanent character and the route an urban one. Under these circumstances the Council has decided to adopt the scheme devised by Mr. R. L. Acland of Chesterfield, and used there, the trolley wires being utilised as feeders, and certain additional apparatus being provided at the point where the supply is taken off. The cost of the latter scheme, for which, luckily, the B. of T. consent is unnecessary, is £486, and it is to be carried out.

Continental Notes.—AUSTRIA.—The construction of a large electrical station at Eisack, near Bozen, in the Tyrol, is contemplated by the firm of Sager & Wörner, of Munich, for the purpose of fixing the nitrogen in the air and manufacturing nitric acid calcium carbide. The cost of the undertaking is estimated at 30,000,000 kronen. Abundant water power is available.

FRANCE.—The concessionaire for the installation of an electric service in the Département of the Tarn has submitted fresh plans to which the Council has accorded its acceptance, subject to a limit of six months for their realisation. The new project, which is much larger than the former one, contemplates installing a hydro-electric station on the River Viaur, near Pampelone, with a dam and reservoir, whence 1,000 H.P. will be obtained.

GERMANY.—The new giant steamer *George Washington*, of the Norddeutscher-Lloyd, which will be placed on the Bremen to New York route in June next, will be fitted with a very complete electric equipment. Some 4,000 electric lamps will be installed throughout the ship, and the first-class cabins will be electrically heated. Ventilation will be provided by means of 24 electrically-driven centrifugal fans, and boat elevators and provision lifts will be worked by electric power. The generating plant will comprise seven large steam dynamos, six of which will be erected in an auxiliary engine room and one on the saloon deck, the last named being an emergency plant in case the engine room should be under water. Each of the seven dynamos will generate 1,000 amperes at 110 volts.

Very extensive plans for the industrial development of the Rheinischwestfalischen district were outlined at a recent meeting of the Bochum Rural Council. It was proposed to erected a single large central station for the supply of lighting and power to the various towns throughout the district, and the details were also settled of the project for the construction of an overhead and underground railway from Dortmund to Bochum.

ITALY.—La Società Elettrica Bistagneso has secured a concession from the authorities of the province of Alessandro to put down a plant for the supply of electrical energy for lighting and power purposes in the town of Bistagno.

BELGIUM.—The Union Electrique Co., of Brussels, has a contract in hand for a 10,000-volt electric power transmission plant between the blast furnaces at Seraing and the rolling mills at Liége of the Société d'Esperance-Longdoz. The boilers will be heated by the waste heat of the blast furnaces; the electrical energy, which will be generated by means of steam turbo-alternators, will be transmitted a distance of about seven kilometres.

Croydon.—At the B.C. meeting last Monday, in reply to a motion to reduce the estimate for street lighting by £250, it was pointed out that compared with 37 large towns in England, averaging £17 16s. per lamp, the Croydon charge per arc lamp was £16. Similarly, for incandescent lighting the average was £3 8s. 5d., as compared with the Croydon charge of £3 3s 5d. In the 37 towns mentioned, the average cost of coal was 11s. 1d. per ton, as compared with a cost of 18s. 6d. per ton in Croydon.

Egypt.—Our contemporary, *African Engineering*, gives some particulars of the installations recently put to work at Port Sudan and Khartoum. These two stations are equipped with Allen-Crompton generating plant, supplied with steam from Davey-Paxman boilers. In the former case one 100-KW. and two 200-KW. 550-volt direct-current sets are installed, and in the latter, two 200-KW. 3,000-volt alternators with direct-coupled exciters. Allen surface condensing plant, economisers and water-softening plant are provided in both stations, while the Port Sudan installation also includes a 240-cell Tudor battery, with Crompton balancer and boosters, and Ferranti switchgear. The distribution in the latter case is by overhead wires to the quays and European quarter, and by means of a submarine cable across the harbour. Messrs. W. H. Allen, Son & Co. were the contractors for the Khartoum installation, and Messrs. Crompton acted in a similar capacity in the case of the Port Sudan plant.

Falmouth.—In connection with the Electric Lighting Order, 1903, application is being made to the B. of T. by the Electric Supply Corporation, Ltd., for consent to the placing of certain electric lines above ground from the electricity works along Beacon Tee and Langton Terrace.

Hanley.—The British Aluminium Co., Ltd., has asked the T.C. if it can supply it with energy for power. The company will require, to start with, 400 or 500 KW. for nine or ten hours per day for 5½ days per week. Messrs. Josiah Wedgwood & Sons, Etruria, have also asked terms for a power supply. Both matters are under consideration.

Hetton-le-Hole.—Messrs. S. Stobart & Co., of Tynemouth, have offered to light the area of the U.D.C., using an overhead wire system, at a cost of £695, and to supply energy at 30s. per 50-C.P. lamps per annum, and 40s. per annum for each pair of 32 C.P. lamps on a five years' agreement.

India.—The generating station of the Bombay Hydro-Electric Supply will be situated near Khapoli, about 40 miles from Bombay. Three valleys are to be dammed, and a head of 1,500 ft. will be obtained, some 50,000 to 60,000 H.P. of plant being installed. The transmission is to be at 45,000volts pressure, and the supply according to present arrangemants will only be available in Bombay for distribution among power users, who have guaranteed some 20,000 H.P. up to the present.

The Mysore Government has agreed to accept from the Mysore City Council a sum of Rs. 20,000 per annum for the lighting of the city and suburban streets.

Japan.—According to the *Indian Textile Journal*, preparations are being made for carrying out the largest of the Japanese electrical power schemes, so far proposed. Three generating stations are to be built in the Province of Shiznoka, about 100 miles from Tokio, to which city the bulk of the energy will be sent. The first station is to work under a 600-ft. head, obtained by impounding the River Oi by means of a dam 700 ft. long and 300 ft. high. The plant will include six three-phase 25-cycle 6,600-volt generators, operated by 13,500-H.P. wheels, together with two 500-H.P. exciters and transformers for stepping up to 66,000 volts for transmission purposes. The transmission line is to be carried on steel towers, 50 ft. high and spaced about 450 ft. centres; it will be in duplicate. Contracts have already been made for some 20,000 KW. supply.

London.—L.C.C.—The General Purposes Committee has issued a report on the alleged encroachment by the Council on the jurisdiction of the Metropolitan B.Cs. in electric supply and other private Bills. The report is of considerable length, dealing, point by point, with the Westminster City Council's complaint. The conclusion arrived at is that the L.C.C. has ample precedent for the amendments complained of; that its tramway and sewer undertakings are such as to give it a constantly increasing interest in street work; and that, as the Council is the ultimate purchasing authority for the majority of the London Co.'s electric supply under-

takings, and has a voice in any linking-up proposals between suppliers, the proposed routes of mains, and future development of electric supply systems are of immediate interest to the Council.

Fulham.—The Electricity Committee has had under consideration the expediency of lighting Fulham Palace Road with metallic-filament lamps attached to the tramway poles, in lieu of the present system of arc lighting from rectified current mains. There are at present 48 arc lamps in this thoroughfare fixed at distances of approximately 60 yards apart. The tramway poles, of which there are 144, are situated 40 yards apart on either side of the road, and the proposal is to attach two 100-volt 50-c.p. lamps, in series, to each tramway pole, and run them from the existing mains. The present cost of arc lighting amounts to £844, and the annual cost of the system proposed would be about £526 and £58 for extra lamps for street lighting in consequence of the removal of the arc lamps from the corners of certain streets affected. The installation of the new system is estimated to cost altogether £507, so that the annual saving would cover the capital charge in two years.

Stoke Newington.—At the request of the North Metropolitan Electric Power Supply Co., the question has been considered of the reduction of the Council's present charges in electricity accounts of 5 per cent. upon the cash receipts for establishment charges. In the result, it was agreed to continue the present 5 per cent., with an alteration in the charge to a minimum of £100 in each half-year for the three years from April 1st last.

Hampstead.—Thirty-three magazine flame arc lamps are to be substituted for the present arc lamps on Haverstock Hill to Heath Street, and three additional posts fitted with flame arc lamps are to be provided at a total estimated cost of £671.

St. Pancras.—The General Purposes Committee has considered the remuneration of the canvasser and consumers' adviser in the electricity department. Owing to the loss of the Euston Hotel supply and the introduction of metallic-filament lamps, the canvasser's commission for the past year only amounted to a little over £4, nothwithstanding the fact that 141 additional consumers had been connected to the mains; the Committee has, therefore, decided that payment should be made to bring his remuneration up to £200 per annum for the year ending December last, and that he be paid a similar amount for the current year in lieu of the salary and commission previously decided upon.

Lyme Regis.—The agreement with the electric light company has been practically settled; 75 and 50-c.p. street lamps are to be provided, numbering 15 in excess of the present number, at a cost of £240 per annum.

Newport.—The Electrical Committee has decided to call a special meeting to consider a scheme for remodelling the Corporation electricity works. It is proposed to "scrap" the Llanarth Street works and add to the Corporation Street works two new machines of 2,000 kw. capacity. The scheme also includes the erection of new electricity offices on the Corporation Road site, with a number of workmen's dwellings adjoining, so that the men will be within easy call in case of a breakdown. The scheme, the principle of which has already been approved, will cost from £68,000 to £75,000.

New Zealand.—The Government Mines Department has recently been furnished with a report by Mr. H. A. Gordon, dealing with a proposal to pump water from the Hokitika River for gold mining purposes at Rimu Flat. This is a hydro-electric scheme—the idea being to utilise a 742-ft. head in the Toaroha River by means of 3,600 b.h.p. Pelton wheels driving 2,500-kw. three-phase generators, and to transmit energy at 20,000 volts pressure over 17 miles to a pumping station on the Hokitika River. The latter plant would consist of 18-in. turbine pumps, each of 8,000 gallons per minute capacity, motor-driven and raising the water some 250 ft. to Rimu Flat, where mining operation would be carried out by hydraulic sluicing. It is considered that the gold mining would be made to pay if the hydraulic sluicing were adopted on a large scale, and efforts are being made by a syndicate to find the necessary capital.

Salford.—At a recent meeting of the T.C. the question of certain resignations from the Electricity Committee was discussed at some length, attention being drawn to the secrecy which has been observed in the matter. Eventually it was announced that the Chairman (Councillor Barrett), Alderman Rudman and Councillors Hailwood and Grundy had resigned, and their resignations were accepted.

South Africa.—In connection with the Harper electric power scheme for supplying electricity on the Rand, which, as has been previously mentioned, will be carried out by the Victoria Falls Co. under agreement, the central power house is to be of some 90,000 kw. capacity, situated in the Klip River Valley. The electrical energy developed by this plant is, it is stated, to be employed largely for driving air compressors for supplying air at 100 lb. pressure for machinery not suited to electric driving, and it is proposed to place 8,000-h.p. compressor plants at suitable points on the Rand, in which the compression will be carried out in three stages, the first stage by turbo-compressors and the remaining ones by reciprocating plant. The importance of the proposal can be gathered from the fact that a saving of 9d. per ton in first cost of power, after allowing financially for disused old plant and proposed new plant, is guaranteed. *African Engineering* points out that during the last two years there has been a reduction of about 4s. per ton, or 20 to 25 per cent., in the working costs of the mines, and every reduction obviously gives the gold mining industry a chance to work poorer rock. At the present time 70 companies are contributing to the gold output, utilising 9,500 stamps and 120 tube mills.

The profit on the Johannesburg tramways for the last half-year amounted to £16,314; and on the electric supply to £29,000.

Swansea.—It is stated that a leading syndicate of electrical engineers and financiers is about to open negotiations with the Corporation with a view to the taking over the electricity undertaking. The syndicate will offer the town absolute immunity from all liabilities, an immediate reduction in the cost of electrical energy, and an abundant supply of cheap power. The syndicate is further prepared to offer to spend £250,000 in developing the undertaking, building new power stations and extending the mains. It is contended that owing to recent improvements in machinery, the present municipal electric plant is worth nothing like the capital that has been expended upon it, and that in a few years the Corporation will be compelled either to secure increased loans or make a heavy call upon the ratepayers. The syndicate further states that there will be an immediate reduction of 5 per cent. to consumers, and guarantees in three years' time to make the reduction 10 per cent. The tramways company has indicated its willingness to take its power from the proposed company, and it is hoped the Harbour Trust might do so also.

Wakefield.—The T.C. has applied to the L.G.B. for a loan of £615 for transformers.

Walkden.—Electricity is to be adopted on a fairly extensive scale at Messrs. E. Lane & Sons, Hope Mills, Walkden, which have lately been considerably enlarged. The supply will be by the Lancashire Electric Power Co.

West Ham.—Mr. A. H. Seabrook, the borough electrical engineer, has drawn up a statement of the past year's working of the electricity department, based upon 11 months' actual results and estimates for the remaining month. From this we learn that there will be a net profit of £2,000, after meeting all charges. The total output for the year is estimated at 15¼ million units, an increase of four millions; the average price received for all purposes is 1d. per unit, and the works and distribution costs are ½d. per unit. The receipts from lighting have diminished by £2,000, mainly on account of the increasing adoption of wire lamps, so that the power load has been responsible not only for the actual net increase in the output, but also for a good deal more. As, in West Ham, sinking fund charges are calculated not from the date of sanction to loans, but from the date of expenditure, which has often occurred before sanction was received, and in many cases the loans have been granted for very short periods, Mr. Seabrook regards the position of the undertaking in this respect as exceptionally sound, and he is certainly to be congratulated on the satisfactory results expected.

Willington (Co. Durham).—The U.D.C. is considering the advisability of establishing electricity works in connection with refuse destructors it is proposed to construct in the three districts in the Council's area.

TRAMWAY and RAILWAY NOTES.

Australia.—Since the beginning of the year the Sydney Tramways Department has opened new routes between Circular Quay and Watson's Bay, to Addison Road and Erskineville, and to Bellevue Hill, and a further route to Lane Cove is about completed. The new electric tramways in Adelaide and suburbs were also opened on March 9th by the Municipal Trust.

Brazil.—An English syndicate has purchased the Porto Aligre electric tramways, known as the Companhia Forca é Luz, for $2,350,000.

Cardiff.—The Tramways and Electric Lighting Committee has recommended the City Council to ask Mr. Brodie, of Liverpool, Mr. Howard Smith, of London, and Mr. King, of Glasgow—three recognised experts in tramway construction—to examine into and present a report on, the condition of the Cardiff tramway tracks, and advise as to the best means of placing the same in a safe and satisfactory condition.

Colombia.—In view of an extension of the contract entered into on February 14th, 1906, with the Compagnia del Tranvia de Barranquilla, the latter undertakes to substitute electric traction (overhead or underground system) for animal traction on all the tramways of the town of Barranquilla. The company undertakes to complete the change in the centre of the town within 18 months from the date of the approval of the plans.

Another contract has been entered into with the Compagnia del Tranvia de Barranquilla for extending the electric tramway system as far as Soledad.

Continental Notes.—Netherlands.—A Committee has been formed at Terneuzen with the object of bringing to a head an important tramway project of the company called the Yserdyksche Stoomtramwegmaatschappij. The plans provide for about 43½ miles of tramway.

The town of Arnhem has arranged to take over the Velp line from the Concessionaire Co. of this line, which is going to be worked electrically.

A project is being formulated by M. Hartog, of Fauquemont, the object of which is to connect up the Limbourg Mines by a system of electric tramways. From Heerlen, the starting point, the lines

would proceed as follows: (1) Heerlen to Amstenrade and Sittard; (2) Heerlen to Valkenhuizen, Kerkrade and Valkenhuizen to Bovenste Locht; (3) Heerlen, Klimmen, Fauquemont, Groot-Welsden, Margraten; (4) Gangelt, Schinveld, Merkelbeek, Amstenrade, Nuth, Schimmert, Ulestraten, Beek, Belgian frontier.

Italy.—A company has just been formed at Lugano with a capital of £20,000, to construct an electric tramway between Lugano, Cadro and Dino.

Dundee.—A sub-committee of the T.C. has reported in favour of an experiment with the trackless trolley system along the Esplanade, and *via* Balgay Hill to Lochee. It was agreed, however, in the meantime to confine attention to the Esplanade. The estimated cost is £5,000, and the manager is convinced that the venture will prove a financial success.

Glasgow.—The T.C. considered a proposal at its first meeting not to employ any men between the ages of 18 and 25 years in the various departments (excluding the police and fire brigade), who are not members of, or do not then agree to forthwith become members of, the Territorial Army. Several thousand men are employed in the electricity and tramways departments of the T.C., and the proposal has created some discussion among them—many looking upon it as an interference with the freedom of the subject.

The T.C. is to be asked to approve of a proposal to extend the tramway system from the present terminus at Garngad to Provanmill, a distance of about a mile.

Hyde.—In the annual budget of the Corporation it is mentioned that the tramways department of the joint board has had a very adverse year, Hyde's share of the loss having been £2,595, or over £200 more than was estimated a year ago. It is estimated that the total deficit to be met for the year by the four Corporations concerned—Hyde, Stalybridge, Dukinfield, and Mossley—will be £10,000.

Japan.—A double-track tramway 30 miles long is being constructed between Kyoto and Osaka. Three 850-kw. turbo-generator units will supply the necessary power to work the line, which is being constructed to the 4 ft. 8½ in. gauge.

Leith.—The directors of the Edinburgh Marine Gardens, Ltd., Portobello, have suggested to the Tramways Committee, an extension of the electric tramway system from Seafield, Leith, eastwards to Portobello. The Committee is to consider the proposal. At present an extension is in progress to Granton.

London.—L.C.C.—The Highways Committee has decided that it would be of advantage to the tramways to secure the wharf and depôt at Battersea Bridge vacated by the Works Department as from March 31st, 1909. The site will be used as a permanent-way depôt for storage purposes, and it is recommended that it should be transferred at a cost of £8,500 to the Highways Committee.

Two of the four 5,000-kw. turbo-generators at the Greenwich power station are now working; these have been supplied and erected at a cost of £43,195, and the two in course of erection will similarly cost £40,800.

It has been decided to enter into an agreement with the Metropolitan Electric Tramways, Ltd., for the latter to continue working the Council's Archway Road tramways to December 31st, 1913, at a rental of £2,500 per annum.

The aggregate capital expenditure on the Council's tramways to March 31st, 1908, amounted to £8,414,591, classified as:—Electric, £6,241,030; horse, £930,201; and obsolete lines, £978,844. Towards the repayment of the debt created by this expenditure, £819,377 had been charged to the date mentioned. The capital expenditure during the year 1907-8 amounted to £1,468,280. The cost of street widenings charged against the tramways up to March 31st, 1908, amounted to £224,395. The surplus on net revenue account for the year 1907-8 amounted to £45,406; this sum with a balance brought forward, making £51,329, was transferred to the renewals fund, which at March 31st, 1908, stood at £158,622, or some £38,000 less than the calculated amount required on a basis of ¾d. per car-mile run.

Newcastle-on-Tyne.—A serious accident occurred on the Tynemouth electric section of the North-Eastern Railway on the 12th inst. Between five and six o'clock, a London and North-Western Railway coach, which had been damaged in collision a day or two previously, was being taken to the repair shop at Walker for temporary repairs. The coach was drawn on a bogie by an engine, and when the train reached South Heaton Junction, the bogie left the line, and the damaged carriage was thrown across the live rail. The resulting short circuit burnt the rail through before the current could be cut off. Owing to the switching-off of the current, the whole of the traffic between Newcastle and Percy Main, a distance of about six miles, was brought to a standstill. A considerable time was taken in repairing the points and switches, and it was nearly four hours before the up-line was cleared, and not until the following morning that the down line was in running order.

Perth.—The T.C. has passed a recommendation by the Finance Committee to borrow £7,000 for tramway purposes.

Quarry Bank.—Following the example of the Brierley Hill U.D.C., the Quarry Bank Council last week passed a resolution asking the Rowley Regis Council to give up to the Rowley Hill and Quarry Bank Councils the rights and powers granted to them under the Quarry Bank, Brierley Hill, and Rowley Regis Light Railways Order, 1903, the object being that the projected light railway connecting these districts may be proceeded with by the two first named Councils.

South Africa.—Application is to be made to the Transvaal Parliament for leave to introduce Bills incorporating the Rand Mines Power Supply Co., Ltd., and the Pretoria Power Co., Ltd. The former Bill seeks to authorise the Central South African Railways to grant the former company permission to use the railway for transmission purposes to the Witwatersrand district. The latter Bill refers to the utilisation of the Crocodile River for a hydro-electric power plant, &c.

Tasmania.—At a meeting of citizens on January 18th, proposals put forward by the Launceston City Council for the installation of electric tramways were approved. It is proposed to enter into a contract with J. G. White & Co. to construct such tramways under specified conditions, the Council supplying the necessary power from the works now lighting the city. The energy generated at a station on the Esk River, is equal to 1,380 h.p., but a scheme is under consideration for increasing it to 3,000 h.p.—*Australasian Hardware and Machinery.*

TELEGRAPH and TELEPHONE NOTES.

Bureau International.—In the annual report, the Bureau International de l'Union Télégraphique states that up to 1906 the funds stood at 62,228·75 fr., but in 1907 this was reduced by 12,336·75; 100,000 fr. is annually voted for expenses by adhering States, and it has been agreed that any difference between this sum and the actual outlay shall in future go to swell the funds. Thus the expenses last year were 83,215·46 fr., and the funds at December 31st, 1908, amounted to 60,008·72 fr.

Paris Telegraph Strike.—On Saturday last a strike of telegraphists took place in the central offices, which after a temporary cessation was resumed on Sunday. On Monday afternoon the men again set to work on the pile of messages which had accumulated, but serious delays took place between Paris and other important centres. The disaffection spread to other branches of the postal service and to other towns, and on Wednesday the whole of the postal and telegraph services were completely disorganised. The staff demand the resignation of M. Simyan, the Postmaster-General.

Telegraph Interruptions and Repairs:—

	Interrupted.	Repaired.
Port Arthur-Chifu	March 9, 1904	
Pontianak-Saigon	Sept. 16, 1908	
Tourane-Amoy	Jan. 19, 1909	
Oran-Tangier	Feb. 20, 1909	Mar. 13, 1909
Cayenne-Salinas	Feb. 27, 1909	
Guernsey-Jersey	Mar. 10, 1909	Mar. 16, 1909

Telephone Transfer.—The Postmaster-General, in reply to a question by Sir George M'Crae, says that the negotiations with the National Telephone Co. now proceeding have in view the continuance of general construction works involving the provision of spare plant for use after 1911. The company is, however, as he understands, prepared to provide plant for all requirements of the service up to the end of that year, when the licence expires.

On the other hand, the company has issued a warning notice to its employés, foreshadowing the failure of the negotiations and the consequent reduction of the construction staff, which numbers over 4,000.

Wireless Telegraphy.—The Canary Islands will shortly be placed in communication by wireless telegraphy with Europe, Africa, and America. The principal station will be in Grand Canary, with a radius of 1,800 miles. Stations will also be established in Teneriffe and in the other islands, for the purpose of interinsular communication. The contract has been given by the Spanish Government to a French company.

Wireless telegraph stations on the Telefunken system are established on the Atlantic coast of the United States at Fire Island (L. 1); Cape Elizabeth (Portland), Me., Cape Cod (North Truro), Mass.; Newport (Torpedo Station), R.I.; Nantucket Lightship (Nantucket Shoals).

The Bill brought into the United States House by Mr. Burke, providing that every passenger steamer carrying more than 50 passengers shall have a wireless telegraph installation, was passed on February 16th. A penalty of $3,000 is provided for in case of violation of its provisions. Vessels must be equipped within a year.

A military wireless telegraph station is to be established at Leeds, to communicate with coastguard stations, war vessels in the North Sea, and Aldershot. The new station will be in connection with the Northern Command Telegraph Companies.

The German Reichstag recently considered the subject of wireless telegraphy in connection with the Postal Estimates. It was stated that 150 vessels were fitted with the Marconi apparatus, and only 17 with the German system. The Secretary of State for Posts mentioned that while the international agreement secured the recognition of German stations on board ship by land stations, British ships equipped with the Marconi system were not bound to enter into communication with German vessels provided with the German system.

CONTRACTS OPEN and CLOSED.

OPEN.

Algiers.—April 1st. The Prefect of Oran will receive applications for a concession to construct and work electric tramways about 18 miles in length.

Australia.—Melbourne.—April 23rd. A power plant for the Central Telephone Exchange, Melbourne. See "Official Notices" March 5th.

Melbourne.—March 25th. 825 opalescent arc lamp globes. See "Official Notices" March 12th.

Melbourne.—April 30th. The Prahran and Malvern Tramways Trustees require tenders for (1) steel rails, fishplates, fastenings and bonds; (2) special work, points and crossings; and (3) steel poles. Specifications by remitting £3 3s. to the secretary.

Sydney.—May 31st. Two 4,700-k.v.a. turbo-alternators, with condensing plant, &c., and one 447-k.v.a. ditto, for the Council's electricity supply department. See "Official Notices" March 12th.

Belgium.—Tongres.—March 27th. The municipal authorities are inviting tenders for the extension of the central electric lighting station.

Brussels.—April 10th. Tenders are required for 10 lots of apparatus, appliances and material for electric lighting of railway trains, by the Administration de Chemins de fer de l'Etat Belge.

Bolton.—March 25th. Materials and stores for the Electricity Committee. See "Official Notices" March 12th.

Brighton.—March 22nd. One 300-kw. three-phase induction motor-generator for Southwick power station for the Corporation. See "Official Notices" March 12th.

Bristol.—March 25th. Coal and other stores for the Electricity Department. See "Official Notices" to-day.

Cardiff.—March 26th. Switchboard, pipework, and cables for the Corporation. See "Official Notices" March 12th.

Darlington.—March 25th. One 500-kw. d.c. dynamo coupled to an exhaust steam turbine, for the Corporation. See "Official Notices" March 12 h.

Edinburgh.—March 29th. Materials for the Electricity Supply Department. See "Official Notices" March 12th.

France.—Paris.—April 6th. Tenders are required for 100 Morse apparatus, and for 2 tons of 0·6 mm. bronze wire, by the Central Depôt of the Army Telegraph Service, 51 Bis, Boulevard de Latour-Manbourg.

Lille.—March 26th. The Maire requires tenders for an electric generator for the public baths in the Rue de Sarrazins.

Govan.—March 30th. Stores for the electricity department. See "Official Notices" March 12th.

Germany.—April 6th. The Prussian State Railway Authorities at Saint Jean Sarrebruck are inviting tenders for the supply and erection of five electric luggage lifts at the railway station at Sarrebruck.

Giessin.—The municipal authorities are about to invite tenders for the construction of a system of electric tramways in the town.

Halle, A S.—The town authorities have decided to extend their station from 12,000 h.p. to 20,000 h.p., at a cost of £100,000. Director Jung has prepared the plans.

Halifax.—March 23rd. Electrical fittings for six months for the B. of G. A. T. Longbotham, Clerk, 4, Carlton Street, Halifax.

London.—Hackney.—April 22nd and May 6th. Arc lamp carbons for one year; also cables, trenching, &c. In both cases tenders have to be handed personally to the chairman at Council meetings to be held respectively on April 22nd and May 6th. See two "Official Notices" March 12th.

L.C.C.—March 24th. Electric lighting, bells and telephones at St. John's Hill Divisional Office, Wandsworth. See "Official Notices" March 12th.

Metropolitan Asylums Board.—March 26th. Electric light installation for the N.E. Fever Hospital, for the above Board. See "Official Notices" March 12th.

Maidenhead.—March 24th. Electrical and engine-room stores for the T.C. C. O. Milton, Borough Electrical Engineer.

Newport (Mon.).—March 22nd. Various lamps and meters for the Electricity and Tramways Department. See "Official Notices" March 5th.

Norway.—April 6th. The municipal authorities of Drammen are inviting tenders for the supply of two electric cranes.

Partick.—April 3rd. Materials for the T.C. electricity department. See "Official Notices" March 12th.

Preston.—March 25th. Electrical sundries for the County Asylum, Whittingham. Thos. Dilworth, Clerk and Steward.

Rotherham.—March 19th. Electrical installation at the girls' secondary school. Holdgate & Harrison, architects, 9, Gray's Inn Square, W.C.

Russian Poland.—The Suwalki town authorities are open to receive tenders for the electric lighting of the town.

Salford.—March 29th. Re-wiring at the Royal Technical Institute, for the Electricity Committee. See "Official Notices" March 12th.

South Africa.—Bloemfontein.—April 16th. Electric light fittings for the new Law Courts of the Government of Orange River Colony. Particulars from Agent-General for the O.R. Colony, 121, Victoria Street, S.W. (£2 deposit).

Spain.—Madrid.—April 7th. The Public Works Department will receive tenders for the construction and exploitation of a tramway from Termens to Lerida. Particulars may be obtained from the Direccion General de Obras Publicas.

April 6th.—The Spanish Post and Telegraph Authorities are inviting tenders for the concession for the working of the urban telephone system in Granada during a period of 15 years.

April 9th.—Tenders are being invited by the Spanish Post and Telegraph Authorities in Madrid for the concession for the working of the urban telephone system in Castellon de la Plana during a period of 15 years.

Speldorf.—April 14th. The railway authorities require tenders for two a.c. motors to drive turning lathes, according to specification, obtainable at 6d. each, from the Werkstätten-Inspection.

Swindon.—March 20th. Steam coal for the electricity works. See "Official Notices" March 12th.

April 10th.—Materials for the Electricity and Tramway Department. See "Official Notices" to-day.

York.—March 31st. Construction of 5½ miles of light railways in the city, and half-a-mile of railways within the rural district of Escrick, for the Corporation. See "Official Notices" March 5th.

Zabrze.—March 31st. The administration of the Royal Mines requires electrical materials, including copper wire, india-rubber-insulated wire, &c., according to specifications, obtainable at 9d. per copy, from the Berginspection II.

CLOSED.

Australia.—An Australian contemporary states that the Oriental Timber Corporation, Geelong, Vic., has given a contract to the Australian General Electric Co. for electrical machinery, to be manufactured by the British Thomson-Houston Co., Rugby. The plant includes a 750-kw., 50-cycle, 480-volt, three-phase Curtis steam turbine of the "mixed flow" type, which will be driven partly by the exhaust steam from the 500-h.p. mill engine and partly by high-pressure steam. About 15 induction motors are being supplied, including a 300-h.p. motor to operate a Gang frame machine, together with switchboard and Tirrill regulator.

Melbourne.—City Council:—

General Electric Co.—33,200 incandescent lamps, £726 13s. 4d.
Veritys, Ltd.—50 arc lamps, £140.
Babcock & Wilcox.—Turbine tube cleaner, £17 10s.
W. Anderson & Sons.—Cast-iron blow down junction for boilers, £13; 933 service, joint and cut-out boxes, £331.
A. Wright & Co.—Photometer (Simmance Abady), £35.

Perth, W.A.:—

British Insulated and Helsby Cables, Ltd.—510 indicators, 8s. 1d.; switchboards, one at £41, one at £10, two at £14, and two at £28 each respectively.
J. M. Ferguson, Ltd.—Telephones, 50 at £2 16s. each, 1,000 at £2 12s. 4d. each; and 30 lb. copper wire, at £8 13s. 6d.

Belgium.—Seven concerns submitted tenders for the supply and erection of the overhead equipment of the Spa-Sart section of the Spa-Verviers light electric railway; the lowest being that of the Union Electrique Co., of Brussels, which quoted £830.

Cirencester.—The U.D.C. has placed a contract with the Power Plant Co., Ltd., to replace an existing straight-cut gear drive on deep-well pump, driven by gas engine, by means of their patent machine-cut double-helical Wuest gears.

Bradford.—The following list of tenders accepted by the Tramways Committee was confirmed by the City Council on Tuesday last week:—

Henry Bessemer & Co.—200 steel tires.
Walter Scott, Ltd.—700 tons of steel girder rails.
Watlington & Co.—Copper bonds.
Bayliss, Jones & Bayliss.—5 tons of steel tie-bars.
Hadfield's Steel Foundry Co.—Manganese steel points and crossings.
Edgar Allen & Co.—12 sets of steel wing crossings.
Thermit, Ltd.—Supply welding portions for use in the welding of 700 rail joints, and certain accessories for use in the process.

Government Contract.—A Government order for the supply of 300 electric drills has been placed with the Consolidated Pneumatic Tool Co., Ltd., Fraserburgh. The contract amounts to about £15,000.

Heywood.—The Electricity and Tramways Committee has accepted the tender of Messrs. J. Allan, Senr. & Son for a new iron staircase. The tender of Messrs. Wm. Smith & Bros., Ltd., for plates and cover trenches in the engine-house, has also been accepted.

London.—Holborn.—The B.C. has appointed Barlow Bros. to carry out electrician's work during the year.

L.C.C.—The following were the tenders received by the Highways Committee for two 1,500-kw. rotary converters, &c., required for use at the Elephant and Castle sub-station:—

Dick, Kerr & Co.	(recommended)	£4,274
Do.	(alternative tender)	4,652
Electric Construction Co.		4,319
British Thomson-Houston Co.		4,490
General Electric Co.		4,636
British Westinghouse Electric & Manfg. Co.		5,601
Bruce Peebles & Co.		9,416

Estimate of Chief Officer of Tramways, £4,500.

For the supply of six static transformers for the same sub-station the tenders were as below:—

British Electric Transformer Co.	(recommended)	£1,879
Dick, Kerr & Co., Ltd.		2,092
British Westinghouse Co.		2,112
General Electric Co.		2,284
Electric Construction Co.		2,427
British Thomson-Houston Co.		2,716
W. E. Burnand & Co.		2,726

Chief Officer's Estimate, £2,000.

The successful tenderer is authorised to sub-let the ventilating fans and motors for these transformers to James Keith and Blackman, Ltd.

Tenders as follows were submitted for a 20-ton overhead travelling crane for the same sub-station:—

Holt & Willetts	(recommended)	£265
A. Jack & Co.		268
James Spencer & Co.		290
John Smith (Keighley), Ltd.		295
Pickerings, Ltd.		295
North British Lifting & Moving Appliance Co.		315
James Carrick & Sons, Ltd.		315
Morley Electrical Engineering Co.		315
J. M. Henderson & Co.		317
B. Johnson & Son, Ltd.		330
Applebys, Ltd.		333
S. H. Heywood & Co.		363
Carrick & Ritchie		368
Do.		375
Chambers, Scott & Co.		370
S. Russell & Sons		385
Chatteris Engineering Works Co.		396
George Anderson & Co. (1905), Ltd.		450
Higginbottom & Mannock		480

Chief Officer's Estimate, £350.

High and low-tension switchgear for the Elephant and Castle sub-station was tendered for thus:—

Spagnoletti, Ltd.	(recommended)	£2,458
Johnson & Phillips, Ltd.		2,495
Switchgear Co., Ltd.		2,670
Whipp & Bourne,		2,732
Ferranti, Ltd.		2,746
British Westinghouse Electric & Mfg. Co.		2,786
Electric Construction Co.		3,057
Electric & Ordnance Accessories Co.		5,983

Estimate of Chief Officer, £2,450

Messrs. Spagnoletti are authorised to sub-let circuit-breaker work to the I.T.E. Co., Ltd., A.C. instruments to Everett, Edgcumbe and Co., Ltd., and A.C. starters to the Premier Control Co.

For the wiring and fitting for electric lighting of Norwood car-shed the following tenders were received:—

Tredegar & Co.	(recommended)	£706
G. E. Taylor & Co.		720
H. G. Whitehead		740
Pinching & Walton		758
Comyn Ching & Co., Ltd.		778
E. Sheldrick & Co.		783
Chas. Pullan		797
G. Weston & Sons		809
Lund Brothers & Co.		930

Estimate of Chief Officer, £900

Electric lighting, bells and fans for the now converting premises for Trade School for Girls, Queen's Square, Bloomsbury:—

Pinching & Walton	(accepted)	£319
Harper Electric Co.		365
G. E. Taylor & Co.		376
C. Pullan		403
R. N. Cunningham & Co.		429
Coming Ching & Co.		494
S. Stobart & Co.		540

Between the highest and the lowest there is much ground for comment!

For the supply of a forging and annealing furnace required for the central car repair depôt the following are the tenders:—

Mountain & Gibson, Ltd.	(recommended)	£128
Alldays & Onions, Ltd.		134
Horsfall Destructor Co.		172
Meldrum Bros.		250

Estimate of Chief Officer, £110.

For the supply of varnish the following tenders were sent in:—

	(1) A gallon.	(2) A gallon.	(3) A gallon.
	s. d.	s. d.	s. d.
R. Kearsley & Co., Ltd., Ripon	6 6	6 0	3 6
Ruberoid Co.	5 0	4 10	9 0
Sterling Varnishing Co.	5 6	5 6	10 6
F. J. Down	7 6	8 6	7 6
Pinchin, Johnson & Co.	7 11	7 11	10 5
General Electric Co.	7 11	8 2	10 7

(1) 450 gallons black baking insulating varnish.
(2) 450 gallons black air-drying insulating varnish.
(3) 450 gallons black finishing varnish for insulating purposes.

The lowest tender has been accepted in each case, viz.: (*a*) Ruberoid Co. for (1) at 5s. a gallon, and (2) at 4s. 10d. a gallon; (*b*) R. Kearsley & Co. for (3) at 3s. 6d. per gallon.

For 2,000 tons and 1,500 tons of cement (south and north side depôts respectively) the lowest offers were accepted:—West Kent Portland Cement Co. (southern), Associated Portland Cement Co. (northern). Total £3,043.

Manchester.—The Corporation has placed with the D.P. Battery Co., Ltd., an order for a storage battery with reversible booster and switchboard. The battery will consist of 240 cells of their T 15 plate type, and is to be erected at the Longdendale Waterworks for dealing with the fluctuating loads of their power installation. It is also to supply current for lighting at a distant point.

Mercedes (San Luis).—The *Review of the River Plate* says that the Compañia Industrial de Electricidad del Rio de la Plata has obtained the contract for the full lighting installation in this town. The station will commence operations during the current year.

Morecambe.—The T.C. on Monday resolved that the tender of the General Electric Co. for arc lamp carbons be accepted.

Plymouth.—The consideration of the tenders for supplying cables (see list on page 429 of our last issue) was the cause of a "scene" at the last meeting of the B.C. In their minutes the Electricity Committee recommended the acceptance of the tender of the British Insulated Co., at an average price of £114. Mr. Anthony, in moving confirmation, explained that three foreign firms sent in lower quotations, but the Committee accepted the tender of the British Insulated Co., because they found from experience that the work of British firms was more reliable than that of foreign. Mr. Debnam pointed out that although the cables would be manufactured by a British firm, the materials of which they were composed might be imported. To throw away £19 in order to give a contract to a British firm who might import the whole of the material was not right. Mr. Debnam having previously advocated the use of local limestone for paving the streets of the town instead of getting it from outside, Mr. Jacobs twitted him on the point, declaring that he did so because in the case of limestone it touched his pocket. This caused a scene of great disorder, and Mr. Debnam denied that he had any interest, either direct or indirect, in local limestone. Eventually the minute was confirmed. Other tenders accepted were:—Carbons, Mr. G. Braulik, £2 17s. 6d., for Conradty C mark; house meters, British Westinghouse Co., Ltd., £1 9s. 4d.

Stalybridge.—The Hyde, Stalybridge and District Joint Tramway Board has accepted the tender of Messrs. Mountain and Gibson, Ltd., and that of the British Westinghouse Co., Ltd., for spare parts for bogie cars.

War Office.—The Secretary of State for War has accepted the tender of Direct-Gas Fuel, Ltd., London, for four sets of the Gregory patent smoke-preventing apparatus, to be fitted at the power house, Enfield Lock.

Weaste.—For the electric light installation at the new baths at Seedley the tender of Mr. Bertram Thomas, Manchester, has been accepted.

Whitehaven.—The T.C. has accepted the following tenders for yearly supplies:—

Vacuum Oil Co.—Oils.
British Thomson-Houston Co.—Carbon-filament lamps, Okonite rubber and Ozokerite tapes.
Ferranti, Ltd., and Chamberlain & Hookham.—Meters.
British Insulated & Helsby Cables, Ltd.—Fuse-boxes.

Austria.—The balance-sheet of the Allgemeine Oesterreichisches Elektrizitäts Gesellschaft, of Vienna, for the last financial year shows a net profit of 1,170,252 crowns; a dividend of 6½ per cent. is being declared.

Germany.—The Electrotechnische Fabrik Rheydt, Max Schorch & Co., of Rheydt, is declaring a dividend of 7 per cent. for the last financial year.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDEEN.—Proposed fish oil factory, for the Scottish Co-operative Wholesale Society.

ABERFELDY (PERTHSHIRE).—Shops and storerooms, for J. MacLaughton and J. MacKerchar, merchants, Bank Street.

ABERGAVENNY.—Residence at Govilon, for I. Gardner; John W. Rodger, architect, 14, High Street, Cardiff.

ABERHAFESP.—School; G. A. Hutchins, architect, Montgomery.

ACCRINGTON.—Rebuilding St. James' Church (£17,000); Grimshaw and Cunliffe, architects. Proposed new Corporation Baths (between £10,000 and £11,000); Borough Engineer, Accrington.

AMERSHAM (BUCKS.).—Two houses, for Brown & Clark; two houses for H. Kennard; house at Chalfont St. Peter, for Thomas and Thomas.

AMLWCH.—New schoolroom, library, vestry, &c., Welsh Congregational chapel (£900); J. Owen, architect, Menai Bridge; G. Pritchard, builder, Almwch.

APPLEDORE (DEVON).—Alterations to the Parish Church (£2,000); Cock and Lamerton, builders, Bideford.

ARBROATH.—Reconstruction of the railway station of the Dundee and Arbroath Joint Railway; J. Bell, engineer, 23, Waterloo Place, Edinburgh.

ASHINGTON (near MORPETH).—Town hall and abattoir contemplated.

BACUP.—Primitive Methodist Sunday School.

BAILDON.—Probable re-erection, after fire, of Clifton Mills, for the Valley Wool Scouring Co. (damage, £12,000). Pair of houses on the Park Mount Avenue Estate, Kirklands Road; J. H. Bakes, architect, Calverley Chambers, Victoria Square, Leeds.

BATLEY CARR.—Probable re-erection, after fire, of works, for A. Hill and Sons (damage, £10,000 to £15,000).

BERKHAMPSTEAD.—Post office; C. H. Rew, architect, 185, High Street, Berkhampstead.

BERWICK-UPON-TWEED.—Development of Magdalene Fields Estate for building; Gray & Boyd, architects, 2, Ivy Place, Berwick.

BINGLEY (YORKS.).—Training college; J. Vickers-Edwards, county architect, County Hall, Wakefield.

BIRKENHEAD.—Dwelling houses; C. Brownridge, borough engineer.

BIRMINGHAM.—Restoration, after fire, of buildings at the Lycett Saddle and Motor Accessories Co.'s works, Alcock Street.

BLACKBURN.—School, Bangor Street (£11,000); Cooper & Slater, architects, Richmond Street, Blackburn.

BLACKPOOL.—Police station; J. S. Brodie, Town Hall, Blackpool.

BLAENAVON.—Alterations to Market Tavern, (for Rhymney Brewery Co.; T. Roderick, architect, Aberdare.

BODMIN.—Enlargement of Bugle United Methodist Church (170 more sittings).

BOGNOR.—Conveniences and lavatories, West Street and on Pier; A. Bridges, architect, Bognor.

BOLTON.—Proposed new skating rink, Spa Road, for a local company. Extensions at Messrs. Crosse & Winkworth's Lever Street Mills; Wm. Cornall & Sons, Ltd., contractors.

BOOTLE (near LIVERPOOL).—Secondary school for girls; Grayson & Ould, architects, 31, James Street, Liverpool.

BOWDON (CHESHIRE).—Secondary Schools for Girls (£9,850); Sankey and Cubbon, architects, Manchester; Gerrard & Son, builders, Swinton, Manchester.

BRENTWOOD.—Rebuilding the Drill Hall; Major F. Turner, Territorial Force Association, Essex County, Bank Chambers, Chelmsford.

BRIDLINGTON.—Addition to Girls' High School; E. R. Matthews, architect, Bridlington.

BRISTOL.—With reference to the statement in our issue of March 5th, Messrs. John Robinson & Co., Ltd., inform us that they are not erecting a new factory. The work merely consisted of galvanised ironwork, which is now practically completed.

BURNHAM (SOMERSET).—Residences on Glen Hilda estate; Price & Jane, architects.

BURNHAM-ON-CROUCH.—Mission Church; H. W. Ridsdale (£910).

BURNLEY.—Electrical installation at Ivy Street Roman Catholic Church. Eight houses in Manchester Road; J. R. Crossley, builder. Skating rink (area 21,000 sq. ft.), Manchester Road; C. Riley, architect, Burnley. Skating rink in Hammerton Street; Mr. Layfield, printer, Hammerton Street. Chapel, house, and offices at cemetery; J. H. Pickles, architect, Burnley.

BURTON-ON-TRENT.—Lavatory block at the Union Offices, for the B.G.; Thos. Jenkins, architect, Arcade Buildings, Station Street, Burton.

CARDIFF.—Skating rink in Cathays Park; C. F. Ward, architect, 71, Colmore Row, Birmingham. Block of offices in Queen Street; E. W. M. Corbett, architect, Castle Street, Cardiff. Six houses, Amesbury Road, for W. H. Preston; and eight houses, Westville Road, for Geo. Paltridge; W. H. Scott, architect, Stacey Road, Cardiff. Two houses in North Road; C. and G. Geen, builders, Cardiff. Six shops, in Crwys Road and Woodville Road, for A. M. Tapson; F. C. Jarman, architect, Cardiff. Shop, in Penarth Road, for J. M. Pritchard; S. Williams, architect, Cardiff. Skating rink at the Hayes, for Empress Rinking Co.; W. H. D. Caple, architect, Cardiff. Y.M.C.A. Institute for Grangetown; Turner & Sons, builders.

CARNARVON.—Alterations at the Queen's Cafe.

CHATHAM.—Bungalow, Walderslade, for A. F. Templeman; houses, Maidstone Road, for Harden & Tansley; Maidstone Road, for Mr. Wakley; Victoria Road, Walderslade, for J. Fenner; Pagitt Street, for T. W. Grieveson, builder, 91, Pagitt Street.

CHARD.—Six shops, at Tatworth, for Co-operative Society. New Mission room.

CHEADLE.—Alterations to premises, High Street, for Messrs. Pritchards. New station building for North Staffs. Railway; C. Dawson, engineer, Stoke; Ball & Robinson, builders, Stoke.

CHESTER.—Skating rink, City Road, for Milton Bode and Edward Compton.

CHICHESTER.—Two villas, St. Paul's Road; F. Hill, builder. Two pairs semi-detached villas, Spitalfield Lane; W. Welcome, builder. Alteration of, and adding shops to, two private houses, South Street; W. Osborn, builder.

CHIPPING NORTON.—New Oddfellows' Hall; Hipkiss & Stephens, architects, 24A, Martineau Street, Birmingham.

CHORLEY.—Probable re-erection, after fire, of Victoria Mills, Lyons Lane, for R. Ryder (damage, £8,000 to £10,000).

CLARE (SUFFOLK).—New Sunday school contemplated, in connection with the Congregational Church.

CLYDEBANK (RENFREWSHIRE).—Four blocks of houses in Radnor Park, Clydebank; R. McAlpine & Sons, builders, Clydebank.

COLNE.—Chapel and school (£3,000); S. Bower, architect, Keighley Road, Colne.

COLWYN BAY.—Refuse destructor and slaughter-house; W. Jones, borough engineer, Colwyn Bay.

CORK.—Church, Mogeely; S. Hynes, architect, South Mall, Cork.

COVENTRY.—Municipal lodging-house; J. Swindlehurst, St. Mary's Hall, Coventry. Developments near Coventry for Warwickshire Coal Co., Ltd.

CRANBROOK (KENT).—Villas, Bedlam Field Estate, for T. Turner.

CROOK.—Refuse destructor; E. Ayton, engineer, Crook.

CROYDON.—Three houses, Nicholson Road, Addiscombe; A. W. Dawson Woodside, S.E. Eight houses, Macclesfield Road; A. W. Hudson, 87, Finsbury Pavement, E.C. Two houses, Addiscombe; S. G. Gee, Beckenham. Two houses, Dalmally Road; G. Miller, Coniston Road, Croydon. Skating rink, Brickwood Estate, Addiscombe; C. P. Crawford & F. A. Wilkins, Liverpool.

DARLINGTON.—Houses (10), Milner Road, Oak Dene Avenue, and Grassmere Road, and alterations to the Royal Hotel; Kitching & Lee, architects. Five houses, Mellard Street, for R. Blackett & Son, builders, 8, Paradise Terrace. Two houses, Beechwood Avenue, for John Guthrie & Son, builders, Corporation Road.

DENTON.—Houses, Lake Road, for E. Richardson; Howard Lane, for Wm. Maydew; Elizabeth Street, for C. Rippingham. Re-building Broom House Inn, Hyde Road, for Gartsides' Brookside Brewery, Ltd., Ashton-under-Lyne.

DINAS POWIS.—Residence for T. V. Rees; Teather & Wilson, architects, Andrews Buildings, Cardiff.

DORCHESTER.—Stables and depôt. P. Harrison, architect, Dorchester.

DOVERCOURT.—Nine houses (£3,570); H. S. Watling, architect, Kingsway House, Dovercourt.

DUKINFIELD.—New Sunday school in connection with Crescent Road, Congregational Church; new Sunday school in connection with Foundry Street Primitive Methodist Church (£2,900).

DUMFRIES.—Alterations to shop premises for W. Martin, shoemaker, 12, Church Crescent.

DUNDEE.—Central reading room (£11,000); City Engineer, City estate offices, Dundee. Alterations to hall in Bank Street; Shiell & Small, solicitors. Additions to St. Martin's Episcopal School, Harcourt Street. Gymnasium, &c., for the Y.W.C.A.; secretary, Y.W.C.A., Dundee.

DUNS.—Premises in Clouds for the Young Women's Club; Mrs. E. Aitken, Nisbet.

DURHAM.—New block at the Technical College; Oliver, Leeson & Wood, architects, Newcastle-on-Tyne; Gradson & Co., builders, Durham.

EASTBOURNE.—Proposed church for the Norway district (£4,000).

EDENFIELD (near BURY).—Large dairy; R. Nuttall.

EMBLETON (NORTHUMBERLAND).—Development of estate for building; Geo. Reavell, jun., architect, Alnwick.

EPSOM.—Eight houses, Hylands Estate, for Gordon Smith. Additions to riding school, for J. Coleman, veterinary surgeon.

ESHER.—Extensive alterations to business premises, Surrey House, for Stiles Bros., drapers.

FALMOUTH.—Two lock-up shops in front of Oddfellows' Hall; H. E. Tresidder, architect, Falmouth.

FEATHERSTONE (YORKS.).—Public baths; W. H. Fearnley, architect, Station Lane, Featherstone.

FOCHRIW.—School (£3,082); D. Pugh-Jones, architect to Cardiff County Council; F. Bond, builder, Beda Road, Cardiff.

FRINTON-ON-SEA.—Additions to "Thalassa," The Esplanade, for G. A. Hutchison. Additions to laundry, Pole Barnland, for Allen and Co. Additions to Alexander Hotel, Old Road, for F. W. Anderson.

GALASHIELS.—Bakehouse at 27, High Buckholmside, for trustees of the late J. Bain, High Buckholmside. Alterations for W. McLaren, iron-founder, Albert Place.

GABALFA (CARDIFF).—New school (150 children); T. M. Franklen, Clerk to the Glamorgan C.C., Council Offices, Westgate Street, Cardiff.

GELLYGAER.—Thirty houses, at Deri, for the Rhymney Iron Co.; two houses, Baldwin Street, Bargoed, for C. Barnett; stables and coachhouse, Hanbury Road, Bargoed, for Dr. C. Reidy; conversion of houses into shops, Hanbury Road, Bargoed, for Mrs. Coe, Hengoed; conversion of houses into shops, High Street, Bedlinog, for Mrs. Llewellyn.

GILLINGHAM.—New Wesleyan Methodist Sunday School and club premises.

GLASGOW.—New Baptist Church at Belshill (seat 600). Additions to buildings, Lynedoch Street, for the Trustees of the U.F. Church; pumping station, corner of Park Street and St. James Street, Kinning Park, for the Corporation; three tenements of dwelling houses in Battlefield Avenue, for R. A. M'Cowat, 8, Brisbane Street, Langside; roller skating rink in Bunhouse Road and Argyle Street, for N. M. Allan, 28, Argyle Street; four tenements of dwelling houses in Govanhill Street, for G. Eadie, 405, Mathieson Street; tenement of dwelling houses and one shop, corner of Leckethill and Bedlay Streets, for the Petershill Building Co., 107, Bath Street, Glasgow. Extension of the Corporation meat market, Moore Street (£65,000); A. B. Macdonald, City Engineer.

GLOUCESTER.—Wesleyan mission hall (£5,000); J. F. Trew, architect, Gloucester; Wm. Crane, Ltd., builders, 80, Forest Road West, Nottingham. New County offices and alterations to the Shire Hall; R. Phillips, consulting surveyor, Shire Hall, Gloucester.

GLYN NEATH.—Twenty semi-detached houses at Cwmgwrach; J. Llewellin Smith, architect, Aberdare.

GOLBORNE (near WIGAN).—Alterations and additions to Parkside Mill School, for Lancashire C.C.; H. Littler, architect, 16, Ribblesdale Place, Preston.

GRAYS.—Additions to the workhouse; C. M. Shiner, architect, Grays, Essex.

GREASBOROUGH (YORKS.).—Alterations to the infants' provided school; county architect, County Hall, Wakefield.

GREAT MEOLS (CHESHIRE).—New parish church; E. Kirby, architect, 5, Cook Street, Liverpool.

GUILDFORD.—Nurses' home in connection with the workhouse infirmary; E. L. Lunn, architect, 36, High Street, Guildford.

HAMBLEDON.—School (£4,800); H. Littler, architect, Ribblesdale Place, Preston.

HAMILTON (N.B.).—Additions to hospital; A. Cullen, Motherwell, N.B.

HAMPTON.—Fourteen houses, Myrtle Road; C. Cain & Sons, builders, Waldegrave Road, Teddington. Houses, St. James' Avenue, for G. H Burges; Milestone & Collis, architects, High Street, Teddington Ten shops and houses, High Street, Hampton Hill, for R. A Cooper.

HANLEY.—Skating rink and motor garage, Stafford Street (£6,000); Chas. Butters & Sons, land agents, Hanley. Alterations to shop, Piccadilly; T. C. Cornwell. Additions to premises, Victoria Road; Cotton and Bladen. Additions to premises, 55 and 57, Market Street; Messrs. Furnival. New church, Fenton Road; Wm. Campbell, architect, 2, Bagnall Street, Hanley.

HARPENDEN.—House and shop, Station Road, for S. W. Skillman. Factory, Grove Road, for Sir Charles Lawes-Wittewronge, Bart.

HAVERFORDWEST.—Working-class dwellings; W. Bevan, architect, Haverfordwest.

HAYES.—Four villas, Cromwell Road, for Foster & Brooks.

HEATON (LANCS.).—Eleven houses in Chorley New Road; Messrs. T. E. Smith & Sons.

HEAVITREE (Devon).—Additions to hospital; F. E. Simpson, architect, Heavitree.

HELMSLEY (Yorks.).—New vicarage at Pockley, for Rev. C. N. Gray.

HEMEL HEMPSTEAD.—School (400 places); Surveyor, Hemel Hempstead R.D.C.

HEREFORD.—Extensions to Shire Hall; R. A. Jack, architect, Shire Hall, Hereford.

HETTON-LE-HOLE (Co. Durham).—Rebuilding Cross House Inn, Easington Lane, for Black & Corballis; hall, Richard Street, for Mr. Barton. School (£4,500); W. Rushworth, architect, Shire Hall, Durham.

HIGHBRIDGE.—Residential buildings on the Clyse; O. Lavis, Market Street.

HIGH WYCOMBE.—New chair works, Leigh Street; Hooper & Nash, architects, High Wycombe.

HINCKLEY.—Proposed public hall (about £5,000); Chairman, Public Hall Committee.

HORSHAM.—Conversion of the Castle Inn, West Street, into two shops, for J. Burton; H. Potter, builder's draughtsman, 72, Spencer Road, Horsham.

HUNCOAT (near Accrington).—Probable developments at Hillock Vale Mills; Simpson & Sharples, Ltd.

ILFORD.—Studio and motor-van shed, Roden Street, for Ilford's, Ltd., Ilford. Conservatories, rear 5 to 21, Aden Road; F. B. Harrison, builder, 166, Balfour Road, Ilford.

IRLAM.—Alterations at Nag's Head Hotel, for Chester's Brewery Co., Ardwick, Manchester.

KEARSLEY (near Bolton).—Improvements at the Council offices.

KINGUSSIE (N.B.).—Extension of Linen Bank; O. Castlenack, Kingussie.

KINGSWINFORD (South Staffs.).—New Council school at Brookmoor (268 boys), and enlargement and improvement of the existing school; G. Balfour, Director of Education, County Education Offices, Stafford.

KIRKBURTON (near Huddersfield).—New school (250 children).

LANGLEY MILL (near Nottingham).—New church; Rev. L. P. Sayles, curate-in-charge.

LANGWITH (near Mansfield).—New Wesleyan Chapel.

LIMERICK.—Proposed extension of Lying-in Hospital.

LITTLE HULTON (near Bolton).—Fourteen houses in Manchester Road for the Little Hulton Co-operative Society.

LITTLEBOROUGH.—New Baths; J. H. Wild, Town Hall, Littleborough.

LIVERPOOL.—Renovation and improved lighting of Tuebrook Wesleyan Church (£1,050); Rev. G. Denton, minister. New Hospital for the Liverpool Maternity Hospital and Ladies' Charity (£15,000), gift of Sir Wm. Hartley. New Welsh Calvinistic Methodist Chapel, in Mentone Avenue.

LLANELLY (Brecon).—New Infants' School at Llanelly-Clydach (100 children); C. W. Best, county surveyor, Brecon.

LLANGOLLEN.—New baths for the U.D.C. (£2,000); T. H. Harrison, engineer, 41, North John Street, Liverpool.

LOCHGILPHEAD (N.B.).—Masonic Hall (£800).

LONDON.—(St. Pancras).—Operating room at the Infirmary, Dartmouth Park Hill, N.; A. E. Pridmore, architect, 2, Broad Street Buildings, London, E.C.

(Norwood, S.E.).—Buildings in New Park Road, Brixton Hill; H. Macintosh.

(Cricklewood, N.W.).—Coal bays, workshops, workmen's cottages, &c. (£10,183); Kirk & Randall, builders, Woolwich.

(East Ham, E.).—Tramway office; A. H. Campbell, engineer, East Ham, Borough Council.

(Tottenham, N.).—Twenty houses, Belmont Avenue; Rowley Bros., care of Hodson & Whitehead, 7, Finsbury Square, E.C. Additions to the Imperial Cold Storage Co.'s premises, Portland Road; Taylor and Kenset, builders, Mitcham Road, Tooting. Weigh office and stores at Gas Co.'s offices, Lordship Hill Lane; A. E. Broadberry, engineer. Sixteen houses, Keston Road; T. Rowley, care of Hodson & Whitehead, 7, Finsbury Square, E.C.

(Barnes, S.W.).—Four houses, Nassau Road; C. Ellis & Co., builders, East Sheen. Twenty-four houses, Clavering Avenue, for Gruntway and Morton, Clavering Avenue, Barnes. Extensions to stores, Mortlake Brewery, for Watney, Combe, Reid & Co., Ltd.

(Hanwell, W.).—Additions to Urban District Council offices; S. W. Barnes, Surveyor to U.D.C.

(Lancaster Gate, W.).—Park View Hotel; D. Joseph, architect, 73, Basinghall Street, E.C.

(Greenwich, S.E.).—Premises, Blackwall Lane, for the Molassine Co., Ltd.

(Ealing, W.).—Dispensary block for new hospital, Mattoch Lane. Clergy house of St. Saviour's, The Grove.

(Regent's Park, N.W.).—Convent; Romaine, Walker & Besant, architects, New Bond Street, W.

(Hampstead, N.W.).—Free church, Hampstead Garden Suburb Estate; Dr. N. Marshall, Baptist minister.

(W.).—Alterations, &c., to premises of G. Cozens & Co., drapers, 32 to 50, Edgware Road; Allen & Co., builders, Pimlico Wharf, 145, Grosvenor Road, Westminster, S.W. Additions to house in Upper Grosvenor Street; W. D. Caröe, architect, 3, Great College Street, Westminster, S.W.

(W.C.).—Buildings in High Holborn; F. Foster, architect, 41, Bedford Row, W.C.

LONGDUFF.—New Roman Catholic Church for Rev. T. O'Reilly; P. Kelly, contractor, Longford.

LOUGHOR (Glam.).—Additions to elementary school; T. M. Franklen, clerk to the C.C.

LYTHAM.—New Wesleyan Church at Fairhaven.

MACCLESFIELD.—New shoe and slipper factory; J. McLerie, Bacup.

MAESYCWMMER.—Shop, house and bakery, for E. J. Smart; T. E. Richards, architect, Market Square Chambers, Pontypridd.

MALVERN.—Public lavatories, for the U.D.C.; J. Evans & Son, builders, Newtown, Malvern.

MANCHESTER.—Re-building and enlargement of business premises, Deansgate, for Thos. Armstrong & Brother, opticians and jewellers. St. James's Hall to be re-built for the Calico Printers' Association (£250,000). Bank; Woodhouse & Dean, architects, King Street, Manchester. New buildings in Trafford Park, for the Hive Factory Co. Warehouse for Lloyd's Packing Warehouse, Ltd.

MARGATE.—Lavatories for the T.C. (£1,585); W. W. Martin, builder, Margate Road, Ramsgate.

MELKSHAM (Wilts.).—Additions to the Avon India-rubber Works.

MELTON MOWBRAY.—Alterations and additions to Cattle Market (£2,900); E. Jeeves, surveyor. Melton Mowbray Urban District Council; E. Clarke, builders, Melton Mowbray.

METHVEN (Perthshire).—Proposed parish hall; G. P. K. Young, architect, 42, Tay Street, Perth.

MEXBOROUGH.—Almshouses for the U.D.C. (£955).

MILNROW (Lancs.).—New boiler houses, &c., at Albert Mills; W. Clegg and Sons.

MIRFIELD (Yorks.).—Two houses, St. Paul's Road, for Johnson & Walker. New dyehouse, Nickhouse Mill, for S. H. Armitage & Co. Rebuilding and extensions at Calder Farm Reformatory, for the West Riding of Yorks C.C. (£12,000).

MONEA.—New Roman Catholic church; J. Flanagan, contractor, Markethill.

MONIFIETH (N.B.).—New hall; Maclaren, Sons & Soutar, architects, 10, Reform Street, Dundee.

MONMOUTH.—New cookery kitchen at Jones's Elementary School; G. F. Grimwood, architect, Monmouth.

MORLEY.—"New Pavilion," corner of High Street and South Queen Street, for the New Pavilion Co., Ltd.; A. Almond, architect, 2, Peel Street.

MOTHERWELL.—School; J. Cowie, architect, Wishaw Street, Motherwell.

NELSON (Lancs.).—Post office; Mr. Ball, architect, Town Hall. Nelson Boothman & Co., builders, Nelson.

NELSON (Glam.).—Council school (£3,930); D. P. Jones, architect to Cardiff County Council; Hamilton & Millard, builders, Caerphilly.

NESTON (Cheshire).—Enlargement of the Congregational Church and new manse (latter the gift of W. H. Lever, M.P.).

NUNEATON.—Proposed conversion of disused factory building into lodging house; Mr. Davis, Coventry.

OULTON BROAD.—House, shop and stabling (£510); H. S. Watling, architect, London Road, North Lowestoft.

PAIGNTON.—Refuse destruction; C. O. Baines, Paignton.

PAISLEY.—Extension of the County Buildings.

PEMBROKE (Co. Dublin).—Alterations at the Town Hall, Ballsbridge; J. C. Manley, clerk to the U.D.C.

PENZANCE.—Block of buildings in South Place, for G. Kettner; O. Caldwell architect, Alexandra Road, Penzance.

PERTH.—Two double villas in Wilson Street, Craigie, for A Miller, Fens Road.

PITSEA (Essex).—Additions to factory, for the British Explosives Syndicate J. S. Nicol, manager.

PONTEFRACT.—Houses, Friarwood Lane, for D. Jackson; warehouse, Market Place, for Muscroft & Co.

POOLE.—Houses, Wimborne Road, for F. Ivemy (W. Andrew, architect, Parkstone); Flaghead Road, Canford Cliffe, for F. Hankinson; Sandecotes, Churchill Road, for J. H. Wilson; Chester Road, for W. Barrett (Fox & Sons, architects, Bournemouth); for Lady Wimborne (T. R. Saunders, architect). Parish room, Kingston Road (A. E. Bastable, architect).

PORTSMOUTH.—Houses, Posbrooke Road; G. Ward, Coburg Street, Landport. House and store, Chichester Road; A. Chase, Porchester Road, Landport. Four shops and hall, Goldsmith Avenue; W. R. Burridge, Fawcett Road, Southsea.

PRESTON.—New offices, for the Preston Shelley Assurance and Burial Society R. Fazackerley, secretary, 15, Lune Street. Swimming baths; Borough Surveyor, Town Hall, Preston.

RADCLIFFE (Lancs.).—New collieries, for the Brynn Hall Coal Co., Wigan New weaving mill in Black Lane; Kenyon Bros., Ltd.

RESOLVEN (Glam.).—New school (300 children); T. M. Franklen, clerk to the C.C., Cardiff.

RICHMOND (Surrey).—Proposed drill hall, for the Richmond detachment of the Sixth Battalion East Surrey Regiment.

ROCHESTER.—Motor store, Corporation Street, for Geo. Batchelor; dyeing house, Old Foundry Wharf, for the Trustees of St. Bartholomew's Hospital; dining room and lavatories, 79, High Street, for L. de Pinto.

ROTHERHAM.—Villa residence, Moorgate; D. B. Jenkinson, architect, Rotherham.

(Bardsley).—New Mission Hall, Westgate (Parish Church); J. E Knight, architect, 33, College Street, Rotherham.

RYE.—Alterations to the Friars, Winchelsea, for G. M. Foreman, K.C.

SABDEN.—New Baptist Chapel and School; F. J. Parkinson, architect, 9, Richmond Terrace, Blackburn.

ST. ALBANS.—Proposed Riding School for the Left Half Battery, 1st Herts 4th East Anglian Brigade, R.F.A. Works, Beaconsfield Road, for the Frist Piano Player, Ltd. (electrically equipped).

ST. ANNES-ON-SEA.—Extension of the Technical School, for the U.D.C. (£1,430); new Council Schools, for Lancs. E.C. (£4,847); villas, Caryl Road, for the North Drive Land Co.; Devonshire Road, for Q. M. and S. Bluhm; South Promenade, for Miss F. Watson; seven houses and shops, St. Andrew's Road South, for J. Shepherd and Sons.

ST. HELENS.—House and shop, Junction Lane, for A. J. Kenwright; houses 37, off Gartons Lane.

SALTCOATS.—Hall in connection with the United Free Church.

SCARBOROUGH.—Refuse destructor and conveniences; H. W. Smith, architect, Town Hall, Scarborough.

SEACOMBE.—New Wesleyan Methodist Church in Claremont Road (£7,180).

SEATON.—Extensions to Clarence Hotel (£445); A. W. Yeomans, architect, Cornhill, Chard; R. G. Spiller, builder, Chard.

SEDGEFIELD (Co. Durham).—New Primitive Methodist Church at Chilton Buildings.

SENGHENNYDD.—New church; E. M. B. Vaughan, architect, Cardiff.

SHAW (Lancs.).—New parish hall (£1,500); Rev. W. M. Hope, Vicar of Shaw.

SKIPTON.—Reconstruction of baths; A. E. W. Aldridge, Skipton.

SLOUGH.—Shop and stores in High Street, for J. J. Isaacs.

SOUTHAMPTON.—Additions to Yacht Laundry, Richmond Road, for S. Tebbutt. Four houses, Lumsden Avenue; Jurd & Sanders, architects, 23, Portland Street, Southampton. Stables, coach house and mortuary, Ascupart Street; Weston & Burnett, architects, 24, Portland Street, Southampton. Chapel and offices in cemetery; J. Crowther, Municipal Buildings, Southampton.

SOUTHERDOWN (Glam.).—Alterations to house and lodge at Craig-yr-Eos, Southerdown, for W. Cope; Cook & Edwards, architects, Bridgend.

SOUTH MOLTON.—Proposed church hall in Duke Street; Wm. Mountjoy.

SOUTH NORMANTON.—New school for Derbyshire C.C. (£4,000).

STANDISH (near Wigan).—House and shop, Bradley Lane, for Rev. C. W. N. Hutton; re-erection, after fire, of a portion of Prospect House, for the Standish Estate Co.

STOCKPORT.—New church at Bramhall.

STONEHAVEN.—Extensions to club house for the Stonehaven Golf Club (£500); secretary.

STRATFORD-ON-AVON.—Alterations and additions to premises in John Street (£788); A. H. Callaway, architect, Union Chambers Stratford-on-Avon; J. Harriss & Sons, builders, Stratford-on-Avon.

STRETFORD.—Additions to technical institute; E. Worrall, architect, Stratford.

SUDBURY.—Additions to the Grammar School (£1,000).

SUNDERLAND.—Electric power sub-station; Bagnall's, South Hylton Forge.

SUNNINGDALE.—Garage at Cowarth Park, for the Earl of Derby.

SUTTON (Surrey).—Detached house, Worcester Road, for E. Thomson; three houses, Elgin Road, for W. B. Richards.

SUTTON-IN-ASHFIELD.—Extension to factory, Silk Street, for G. Walton and Son.

SWADLINCOTE.—Armature winding shed, Gresley Colliery, for the Gresley Colliery Co.

SWANSEA.—Welsh Calvinistic Methodist Chapel at Raven Hill, in connection with Babell Church. Ten houses at Pentre, for Swansea T.C.; borough surveyor, 13, Somerset Place.

TAUNTON.—Residences in Holway; Mr. Moggridge, builder.

TEDDINGTON.—Four houses, Winchendon Road; G. A. Gale, builder, 480, Fulham Road, S.W. Additions to Munster Lodge, Broom Road, for G. Metcalf.

THURSO.—Proposed new hospital.

TICKHILL (near Rotherham).—Business premises, Castle Gate, for the Doncaster Co-operative Society; model bakery, Market Place, for Jarvis & Sons.

TRURO.—Four houses in Treyew Road; Harris & Sons, Truro, builders and architects. Dwelling house and stables for Mr. Crocker; Mr. Nichols, Truro, builder; L. Winn, architect, Truro.

TUNBRIDGE WELLS.—Extensive improvements to business premises for J. W. Goldsmith, Ltd., drapers, &c.

TWICKENHAM.—Two houses, Nelson Road; J. Wills, builder, Kneller Road, Hounslow. Workshop, St. Margaret's Works, Winchester Road; E. J. Partridge, architect, Bank Chambers, Richmond.

UDDINGSTON (Lancs.).—Slaughter-house; G. Patterson, architect, Hamilton.

UPPERMILL (Yorks.).—New Council school, for the West Riding Education Committee.

VENTNOR.—Additions to Town Hall offices; H. Oakes, Ventnor.

WALKDEN.—Thirty-eight houses, Old Clough Lane; E. & G. A. Lane, Hope Mills, Walkden.

WALLSEND-ON-TYNE.—Extensions to the fever hospital, for the Wallsend and Willington Quay Joint Hospital Board; J. F. Davidson, architect, 50, Grainger Street West, Newcastle-on-Tyne.

WALSALL.—Sewerage scheme, for the T.C. (£62,734); J. Taylor, borough engineer. Rebuilding Rovers' Rest public house, Bloxwich Road, for the Northampton Brewery Co. Rebuilding Golden Eagle public house, Green Lane, for the Wolverhampton and Dudley Brewery Co.

WALTON-LE-DALE (near Preston).—Proposed Roman Catholic schools, on site given by Sir James de Hoghton, Bart., Hoghton Tower.

WARGRAVE (Berks.).—Houses and public buildings, for Ferribee & Dennis.

WATERLOO (near Liverpool).—Eight houses, Sandheys Avenue, for T. G. Williams; three houses, Park Avenue, for C. & W. E. Brooks.

WEDNESBURY.—Public elementary school in Holyhead Road (1,200 children); Town Council.

WHITBY.—Two houses, St. Hilda's Terrace, for W. James; J. Braim, builder.

WHITEHAVEN.—Two semi-detached houses, Victoria Road, for T. Burns; J. S. Moffat & Bentley, architects, 53, Church Street. Shops and offices; A. Anderson, builder, New Road.

WIDNES.—Motor-'bus garage and workshops; J. Sinclair, architect, Widnes. Alterations and additions to Warrington Road Schools; G. H. Danby, Education Department, Town Hall, Widnes.

WINDSOR.—Lodge in the Long Walk, Windsor Park; E. Bampfylde, builder, Windsor. Rebuilding of furniture depository, after fire, for Mark Davies, 77, Peacod Street; rebuilding of the Riverholme Hotel, after fire, for Miss Outlawe, South Western Hotel, Windsor.

WOLDINGHAM.—Residence, Longhurst Road (£2,000); A. M. Cawthorne, architect, 120, Victoria Street, S.W.

WOLVERHAMPTON.—New school at Graisley; Alderman Johnson, Chairman of the Education Committee.

WORKSOP.—Twelve semi-detached villas, Highland Grove, for J. E. Lobley.

WORSLEY (Lancs.).—Houses, 40, off Kay Street, for the Co-operative Society; Barton Road, for J. J. Blackburn; stud farm, off Walkden Road, for the Earl of Ellesmere.

WREXHAM.—Additions to baths; J. England, Wrexham. New Primitive Methodist Church and Institute in Poyser Street (£3,000).

WYCOMBE.—Proposed public swimming bath; T. J. Rushbrooke, borough surveyor.

WYLAM-ON-TYNE (Northumberland).—New Council school; C. Williams, secretary to the Education Committee, The Moothall, Newcastle-on-Tyne.

YIEWSLEY.—Public house, Catherine Wheel, Horton Road; F. J. Fisher, architect, 14, Queen Street, E.C.

YORK.—Car-shed and workshops; F. Spur, engineer, Guildhall, York.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

The following orders are issued:—

Commanding Officer—Col. R. E. B. Crompton, C.B.

Monday, March 22nd.—"A" Company. Infantry drill (recruits), 6 to 7 p.m. Telephone examination, 7 p.m.

Tuesday, March 23rd.—"B" Company. Infantry drill (recruits), 6 to 7 p.m. Telephone examination, 7 p.m.

Thursday, March 25th.—"C" Company. Infantry drill (recruits), 6 to 7 p.m. Telephone examination, 7 p.m.

Friday, March 26th.—"D" Company. Infantry drill (recruits), 6 to 7 p.m. Telephone examination, 7 p.m.

Saturday, March 27th.—"D" Company. Week-end run at Coalhouse; parade at Fenchurch Street Station at 3.10 p.m.

(Signed) J. H. S. Phillips,
Capt. and Acting Adjutant.

INQUIRY COLUMN.

[Replies should be accompanied by stamped envelopes ready for retransmission to our correspondents.]

Makers of Selenium or Selenium Cells, and makers of the Climax Carbon-Filament Lamp, are asked for

FORTHCOMING EVENTS.

Royal Institution.—Friday, March 19th.—At 9 p.m. Paper on "Experiments at High Temperatures and Pressures," by Mr. R. Threlfall.

Saturday, March 20th.—At 3 p.m. Lecture on "The Properties of Matter," by Prof. Sir J. J. Thomson. (Lecture IV.)

Saturday, March 27th.—At 3 p.m. Lecture on "The Properties of Matter," by Prof. Sir J. J. Thomson. (Lecture V.)

Institution of Electrical Engineers (Glasgow Students' Section).—Friday, March 19th.—At 8 p.m. At the Technical College, Glasgow. Paper on "Electrically-Driven Centrifugals and Accessories," by Mr. J. H. McMinn.

Institution of Electrical Engineers (Glasgow Section).—Friday, March 19th. At 8 p.m. At 207, Bath Street, Glasgow. Paper on "Notes on Safety of Working Electrical Plants in Coal Mines," by Mr. S. A. Simon. (Postponed meeting of Tuesday, March 9th.)

Junior Institution of Engineers.—Saturday, March 20th.—At 7.30 p.m. At Caxton Hall, Westminster. Conversazione.

Saturday, March 27th.—At 3 p.m. Visit for the inspection of the electrification plant of the South London line of the L.B. & S.C. Railway.

Liverpool and District Electrical Association.—Saturday, March 20th. At 3 p.m. Visit to Bootle Electricity Works.

Institution of Electrical Engineers (Newcastle Section).—Monday, March 22nd. At 7.30 p.m. At the General Post Office, Newcastle. Demonstration by Mr. Tremain of Long-Distance Telephone Transmission and Superimposing.

Royal Society of Arts.—Monday, March 22nd. At 8 p.m. Cantor lecture on "Steam Turbines," by Mr. G. G. Stoney. (Lecture I.)

Institution of Electrical Engineers (Manchester Section).—Tuesday, March 23rd. At 7.30 p.m. At the University, Manchester. Annual general meeting.

Institution of Electrical Engineers (Leeds Section).—Meeting arranged for Wednesday, March 24th, postponed.

Institution of Electrical Engineers (London).—Thursday, March 25th. At 8 p.m. At the Institution of Civil Engineers. Paper on "The Electrical System of the L.C.C. Tramways," by Mr. J. H. Rider.

Rugby Engineering Society.—Thursday, March 25th. At 8 p.m. At Benn Buildings, Rugby. Paper on "The Propulsion of Ships," by Mr. G. M. Brown.

Electro-Harmonic Society.—Friday, March 26th. At 8 p.m. At King's Hall, Holborn Restaurant. Last smoking concert of the season.

Physical Society.—Friday, March 26th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Papers on "Note on the Production of Steady Oscillations in Closed Circuits, and a Method of Testing Radio-Telegraphic Receivers," by Prof. J. A. Fleming; and "The Effect of an Air Blast upon the Spark Discharge of a Condenser Charged by an Induction Coil or Transformer," by Prof. J. A. Fleming and Mr. H. W. Richardson.

Association of Engineers-in-Charge.—Saturday, March 27th. Annual dinner.

NOTES.

The Electrical Trades Benevolent Fund Dinner of March 30th.—We learn from Mr. Justus Eck, the chairman of the committee meeting held on Tuesday, that Mr. W. M. Mordey, Mr. R. K. Gray, and Professor John Perry have consented to act as vice-presidents on the above important occasion. Mr. T. E. Gatehouse has undertaken to be responsible for the musical programme which will be performed during the evening.

A New Insulating Material.—At a recent meeting of the American Chemical Society, Dr L. H. Backeland presented a paper describing the manufacture and properties of a new insulating material, "Bakelite." This is a product of condensation of phenols and formaldehyde, but differs from those usually obtained by being entirely insoluble in all solvents. Furthermore, it withstands alkalies, chlorine and almost all known chemicals. It is destroyed, however, with boiling concentrated sulphuric and nitric acids, though it withstands the action of dilute acids. It is a non-conductor of electricity, and as it can be heated to 300° C. without softening, it forms an excellent insulating material. At the temperature of melting glass bakelite chars without fusing. Its one weak point is that it is not as elastic as hard rubber or celluloid, and therefore cannot be used where great flexibility is required. It is now being tried in some 40 industries, and is destined to bring about great changes in many of these. For dynamos or motors it will probably be of great service, as windings impregnated with this substance show less tendency to burn out when the plant is overloaded. Bakelite can be mixed with substances like mica and asbestos and accurately moulded. These mouldings offer great resistance to heat, and exhibit extreme strength; consequently they are a great improvement on porcelain and other forms of insulators. Another proposed use is as a bearing material. In a test extending over nine hours at 1,800 R.P.M. no heating or injury was observed on the quickly revolving shaft, although no lubricating material was applied. The cost of this material is not stated, but it is mentioned that it is considerably less than that of hard rubber.

Electro-Harmonic Society.—The last smoking concert of the season is to be held on Friday next at the Holborn Restaurant. Messrs. Henry Turnpenny and Bantock Pierpoint are the vocalists announced for the occasion, and the other arrangements in the programme are as follows:—Humorous recitations by Mr. Charles Wreford; humorous songs by Mr. Walter Walters; contributions by Mr. John L. McCallum (Scotch humourist); humorous sketches by Mr. Nelson Jackson. By way of variation from all this humour, there are to be instrumental selections by a small orchestra of strings with piano and Celesta.

Appointments Vacant.—*Indian Engineering* for February 20th says that the Government of Madras are taking steps to take out from home, on a three years' covenant to begin with, a fully qualified Electrical Inspector for the Madras Presidency. The works of the Madras Electric Supply Corporation are approaching completion. Our contemporary believes that the officer appointed would not only be required to carry out the duties imposed by the Indian Electricity Act, but would also be the adviser or consultant to the Government on electrical matters generally. An engineer fitter is required for the Camberwell Infirmary (45s.), also an installation assistant for Belfast Corporation (30s.).

South-Western Polytechnic Institute.—The thirteenth annual distribution on prizes and certificates to the students of the evening classes and day college took place at this Institute on Friday last, when Prof. Henry A. Miers, D.Sc., F.R.S., principal of the University of London, presented the awards.

Trade Marks Infringement Act Prosecution.—At the Thames Police Court on Wednesday, the magistrate, Mr. Chester Jones, delivered judgment in the case of W. H. Keys, who was the defendant in two summonses under the Trade Marks Infringement Act. The Magistrate said the defendant was charged with selling Lake Trinidad asphalt as Lake Trinidad bitumen. There were two summonses, one for applying a false trade distinction, and the other for falsely describing the constitution of the materials, but he thought he could treat them both as meaning the same thing. It appeared to him that bitumen had been properly described by a witness for the prosecution as pitch, and he could not see why manjack ought not to be described as Trinidad bitumen. It was common ground that bitumen in its natural state was no use to anybody for industrial purposes unless it was mixed with a considerable amount of flux in this country. Therefore, he did not think it could matter if the bitumen itself was described as coming from the shores of any particular lake. He thought that the two summonses should be dismissed, as there was no false description as to place of origin, or as to the constitution of the material. He thought there was not sufficient certainty attached to the meaning of the different terms to enable him to take any other course. As there had been 15 sittings in the hearing of the case, he held that the defendant was entitled to £150 costs.

Electric Fire-damp Signal.—An apparatus has been constructed by Heis, of Bochum, for indicating the presence of fire-damp in mines. A selenium cell is mounted behind a safety-lamp and connected with a battery and bell. When the lamp flame turns blue, owing to the presence of fire-damp, the electric conductivity of the selenium cell is lowered, and an armature, previously attracted by an electro-magnet, is released. This armature completes a second circuit, which rings the bell, indicating danger and warning the miners to retire.—*Mining Journal.*

Institution and Lecture Notes.—Redruth School of Mines.—Mr. L. Harris, manager of the Urban Electric Supply Co., attended by invitation at the Redruth School of Mines on the 11th inst. and delivered a lecture on "The Application of Electricity to Cornish Mining." A large audience, composed of students and leading mining men, was presided over by Mr. F. D. Bain, J.P. Mr. Harris, in the course of his address, demonstrated that electric power could be produced more cheaply in a central station, working under favourable conditions, than by a large number of small engines, each with its separate boiler plant, scattered over a large area. Having enumerated what he considered the advantages generally of electric power supply, Mr. Harris proceeded to enlarge upon the results achieved at South Crofty, where an output at the rate of 40,000 tons per annum had been treated electrically on the surface for nearly two years. At another mine, working on the old system, it was costing from 2s. to 2s. 3d. per ton to do the work which was being done at South Crofty for less than 1s. 6d., a saving of 20 to 30 per cent. The lecturer then dealt exhaustively with electric pumping, showing the efficiency to be obtained, and the comparative cost in installation and upkeep. He also dealt with the application of electricity for winding, and, in conclusion, said that at South Crofty mine, with electric power, the surface equipment was costing about 65 per cent. of the cost at another mine working on the older system with about the same output of ore per annum. The best results were not to be gained from electricity by using it in a small way. By using it on a liberal scale for all purposes the best results could be, and had been, achieved. A short discussion followed.

Junior Institution of Engineers.—A large number of members of this Institution, with the permission of Messrs. J. & E. Hall, Ltd., recently paid a visit to their extensive refrigerating machinery and automobile works at Dartford. The next visit of the Institution takes place on March 27th, when Mr. Philip Dawson, M.Inst.C.E., conducts a party to inspect the equipment in connection with the electrification of the South London line of the London, Brighton and South Coast Railway.

Bristol Association of Engineers.—Recently a paper was read by Mr. H. H. Couzens, deputy city electrical engineer, on "Some Recent Developments in connection with Electrical Power Transmission in Bristol."

The Society of Engineers has decided to award a "Status Prize" each year for the five years ending 1913 for the best paper by any person on the subject of "How to Improve the Status of Engineers and Engineering, with special Reference to Consulting Engineers." The prize will be three guineas' worth of books or instruments to be chosen by the successful author. Papers for the present year are to be sent in on or before June 30th next, addressed to the Secretary of the Society of Engineers, 17, Victoria Street, Westminster.

Electrical Football League.—The following is a table of results of matches up to March 13th, 1909:—

Name of club.	Played.	Won.	Lost.	Drawn.	Points.
Metropolitan Electric F.C.	9	9	—	—	18
County of London ,, ,, ...	8	6	1	1	13
St. Pancras ,, ,, ...	9	4	3	2	10
General ,, ,, ...	10	3	4	3	9
St. James' ,, ,, ...	11	3	6	2	8
Robertson's ,, ,, ...	9	3	5	1	7
Ediswan ,, ,, ...	9	—	8	1	1

The following are the arrangements for to-morrow, Saturday: Ediswan F.C. *v.* St. James'; Robertson's *v.* County of London.

A Council meeting of the League is to be held at 19, Carnaby Street, S.W., on Thursday, March 25th, at 7 p.m. The secretary, Mr. J. W. Fraser, 39, Wearside Road, Lewisham, S.E., will be pleased to hear from clubs desirous of joining the League.

On Saturday last Robertson's Lamp Works defeated the General Electric Co. by 4 goals to nil.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. Littlehailes has resigned his position as station superintendent at the Burgh of Partick Electricity Works, to take up the position of mechanical and electrical engineer at Large Street Works, in the vicinity of Glasgow. Mr. Littlehailes was presented with a silver cake basket, &c., by the staff and employés of the above department.

Mr. Frank Fletcher, of Great Lever, Lancs., has been appointed mains superintendent to the Rochdale Corporation electricity department. He was formerly switchboard attendant at Rochdale.

Tramway Officials.—The Doncaster Tramways Committee has appointed Mr. G. A. Baxter, since 1905 chief tramway inspector at Walsall, as chief inspector of the tramways.

Mr H. Coxon, who for a period of 10 years has been connected with the various sections of the Birmingham and Midland Tramways Joint Committee, has resigned his position, and leaves England on the 27th inst. for Mexico.

Mr. R. B. Goodyer, who has been for nearly 20 years in Cardiff as manager for the Provincial Tramways Co., Ltd., has just severed his connection with the management of the motor-buses running between Cardiff and Whitchurch. Mr. Goodyer was traffic manager for the Edinburgh Street Tramways Co. and manager for the Rothesay Tramways, also the London Road Car Co., and before he came to Cardiff in 1889, he was for some time engaged as expert adviser in Paris to the Continental Metropolitan Tramways Co. He has also taken part as a consultant in the reorganisation of tramway systems in various towns. Mr. Goodyer is father to the present manager of the Croydon Corporation tramways.

The Bournemouth T.C. has accepted with regret, the resignation of Mr. H. Godfrey Andrews, assistant borough electrical engineer, who wrote stating that owing to the suggested alteration in the administration of the department, he had obtained a more advantageous appointment elsewhere. Pending the re-organisation of the department, Mr. Bulfin, the borough electrical engineer, did not submit any proposals as to filling the vacancy. The Council recently decided the terms and conditions for the engagement of the new general manager of tramways.

General.—The *Indian and Eastern Engineer* for February says that Mr. H. P. Gibbs, the chief electrical engineer to the Government of Mysore, is retiring, and the chief engineer to Government, Mr. W. McHutchin, is advertising for applications for the post up to May 15th. Mr. Gibbs, after several years of erecting work in the United States, went out to India with Mr. Ekström to install the Cauvery equipment on behalf of the G.E. Co., of Schenectady. In 1903 he was appointed chief electrical engineer, Mysore, and in that capacity has been responsible for the second and third installations of the Cauvery plant. He designed the electric lighting schemes for Mysore and Bangalore and the Palace installations at Mysore and Ootacamund. In 1905 he was appointed consulting electrical engineer to the Kolar Mining Board, and for them he has designed and carried out large electrical winding schemes.

It is stated that Madame Curie will preside over the Electro-Chemistry Section at the International Congress of Chemists, which is to be held this year in London.

An American exchange states that Mr. Louis A. Herdt, Associate Professor of Electrical Engineering at McGill University, will succeed Prof. Owens in the Chair of Electrical Engineering.

Mr. John Wayne-Morgan, consulting engineer, has just removed from 59, Queen Street, Cardiff, to 6, Church Road, Whitchurch, Cardiff.

Obituary.—The death took place last week of Mr. Charles Ford, of Rectory Road, Burnley, who had served as electrician to the executors of Col. Hargreaves, who own extensive coalmines, for a period of 20 years. He had oversight of all the electrical apparatus in connection with the firm's various collieries.

The death is notified from Dover of Mr. Samuel Beaumont, head of the firm of Messrs. Beaumont & Son, electrical engineers, of Roubaix, France, where he established the business some 30 years ago. He was 72 years of age.

The death has occurred, at the age of 69 years, of Mr. Edwin Evans, engineer at the electricity works at Eaton Hall. He had been engaged on the Duke of Westminster's estate for 47 years.

NEW COMPANIES REGISTERED.

Thorium (Metal Filament) Lamp Works, Ltd. (101,846). This company was registered on March 4th, with a capital of £30,000 in £1 shares (11,000 preference), and to adopt an agreement with Merchants' Trading Co., Ltd., and to carry on the business of manufacturers of and dealers in metal-filament and other electric lamps, electric lamp fittings, apparatus and accessories, &c. The subscribers are:—J. Walker, M.I.C.E., &c., Wildlands, Cottenham Park, S.W., 100 pref. shares; J. Gillespie, 1, Leadenhall Street, E.C., engineer, 100 pref. shares; C. R. Dewhirst, Pine Ridge, Broadstone, secretary, 1 pref. share; S. G. Sandeman, 27, Crescent Road, Brockley, S.E., engineer, 1 pref. share; L. J. A. Gay, Orielton, Norman Road, Sutton, insurance clerk, 1 pref. share; C. H. Brookes, 48, Brocklebank Road, Wandsworth, clerk, 1 pref. share; W. H. Disney, 7, Arlington Gardens, Ilford, clerk, 1 pref. share. Minimum cash subscription, seven shares. The number of directors is not to be less than two or more than seven: two are to be nominated by the Merchants' Trading Co., Ltd., and others by subscribers. The first are J. Walker and J. Gillespie; qualification (except directors nominated by the said "Trading Co.") £100; remuneration (except managing director) £100 per annum (chairman £50). One of the directors appointed by the said "Trading Co." shall be managing director, and shall receive an extra £150 per annum. Registered office, Broad Street House, New Broad Street, E.C.

Lepel Wireless Syndicate, Ltd. (101,881).—This company was registered on March 6th, with a capital of £20,000 in £1 shares, to adopt an agreement with E. G. Abrahams, and to carry on the business of electricians, engineers, battery makers, founders, producers, generators, distributors and workers of electricity, lava, submarine and wireless and aerial telegraphy, &c. The subscribers (each with one share) are:—A. Simpson, 5, Albany Courtyard, Piccadilly, W., electrical engineer; J. Carte, 5, Albany Courtyard, Piccadilly, W., secretary; H. E. Knight, 5, Albany Courtyard, Piccadilly, W., manager; F. M. Watts, 5, St. Maur Road, Fulham, S.W., clerk; H. Gough, 49, Lyndhurst Grove, Camberwell, S.E., clerk; Capt. C. Wyld, Guards' Club, London; J. H. Goodwin, 5, Arlington Street, W., clerk. Minimum cash subscription, £5,000. The number of directors is not to be less than three or more than nine; the first are E. G. Abrahams, A. Holt, Viscount Masserene and Sir Thomas Wyles; qualification, 100 shares; remuneration, 5 per cent. of the distributed profits. Purchase consideration, £11,000 (£2,000 cash and £9,000 shares). Registered office, 4, The Albany Courtyard, Piccadilly, W.

Dalziel's Constant Voltage Patents, Ltd. (101,833).—This company was registered on March 4th, with a capital of £10,000 in £1 shares, to acquire certain patents and interests in patents for inventions relating to electric lighting of trains and the automatic control of the voltage of electric apparatus to develop and turn to account the same, and to adopt an agreement with J. Dalziel and T. Waterhouse. The subscribers (with one share each) are:—H. M. Gray, Broompark, Duffield, gentleman; Mrs. E. S. Marsden, Mile Ash, Derby; G. H. Smith, Quarndon, near Derby, manufacturer; E. G. Smith, Elms, Quarndon, near Derby, manufacturer. Private company. The number of directors is not to be less than three or more than five; the first are H. M. Gray, T. Waterhouse, C. S. V. Brown and E. M. Sellon; qualification, £100; remuneration as fixed by the company. Registered by Jordan & Sons, Ltd., 116-17, Chancery Lane, W.C.

Mica Supply Co., Ltd. (101,825).—This company was registered on March 3rd, with a capital of £3,000 in £1 shares, to carry on the business of miners, growers and producers of mica, asbestos, xylite, rubber and other mineral or natural products used in connection with the insulation of electrical machinery, &c. The subscribers (with one share each) are:—W. G. Harrison, 21, Wolseley Avenue, Wimbledon Park, managing clerk; H. P. W. Smith, Fonthill, Church Street, Woking, accountant. Private company. The number of directors is not to be less than three or more than five; the subscribers are to appoint the first; qualification, £50; remuneration as fixed by the company. Registered by Andrews, Fawcus, Ogilvie & Fisher, 32, Essex Street, Strand, W.C.

Gratze, Ltd. (101,857).—This company was registered on March 5th, with a capital of £3,000 in £1 shares, to carry on the business of engineers, electricians, founders, smiths, machinists, machinery builders and general contractors, &c. The subscribers (with one share each) are:—E. V. Gratze, Woodhayne, Walwood Park, Leytonstone, electrical and mechanical engineer; A. Chapman, 8, Warwick Court, Gray's Inn, W.C., solicitor; A. V. Oakley, The Grove, Seaton, Devon, journalist; Miss M. L. Oades, Avondale, Nicholl Road, Epping. Private company. The number of directors is not to be less than two or more than six; the first are not named. Registered office, 44-6, Whitfield Street, Tottenham Court Road, W.C.

W. Sitch & Co., Ltd. (101,868).—This company was registered on March 5th, with a capital of £4,000 in £1 shares, to take over the business of electrical engineers, manufacturers of electric fittings and art metal workers, carried on at 48, Berwick Street, Oxford Street, W., as "W. Sitch & Co.," and to adopt an agreement with A. Sitch and Frances Edwards. The subscribers (with one share each) are:—A. Sitch, 48, Berwick Street, Oxford Street, W., electrical engineer; Mrs. F. Edwards, 48, Berwick Street, Oxford Street, W. Private company. The number of directors is not to be less than three or more than five; the first are A. Sitch and Frances Edwards (both permanent), and W. J. Cornish; qualification, £50 shares, stock or first mortage debentures. Registered office, 48, Berwick Street, Oxford Street, W.

Lyme Regis Electric Light and Power Co., Ltd. (101,894).—This company was registered on March 8th, with a capital of £5,000 in £1 shares, to carry on in Lyme Regis, Dorset and elsewhere the business of suppliers of electricity for light, heat, motive power or otherwise, electrical and mechanical engineers, electricians, &c., and to adopt agreements with the Corporation of Lyme Regis. The subscribers (with one share each) are:—P. H. G. Woodroffe, 96, Piccadilly, W., gentleman; A. Emery, 4, Arundel Street, Strand, W.C., clerk; W. H. Glendinning, 4, Arundel Street, Strand, W.C., clerk; W. F. Rossiter, 4, Arundel Street, Strand, W.C., solicitor; H. J. Ramsbotham, Charterhouse, Godalming, solicitor; B. H. Clayton, 4, Arundel Street, Strand, W.C., clerk; E. S. Saxton, 4, Arundel Street, Strand, W.C., clerk. Minimum cash subscription half the shares offered to the public. The number of directors is not to be less than three or more than six; the first are W. Allhusen, A. D. Pass, P. H. Woodroffe, R. F. Browne and A. J. Woodroffe; qualification, £50. Registered by Withers Bensons, Birket and Davis, 4, Arundel Street, Strand, W.C.

Telephone Instalment System Co., Ltd. (101,982).—This company was registered on March 12th, with a capital of £10,000 in 9,995 ordinary shares of £1 each, and 100 founders' shares of 1s. each, to provide by loans or otherwise, or to guarantee for approved persons, firms, companies, and institutions, the subscription, rent or other payments required by the various telephone companies and institutions of the United Kingdom and elsewhere, to manufacture and deal in telephones, inventions, patents, or improvements, &c. The subscribers (with one share each) are:—J. D. Fletcher, 4, Yerbury Road, Tufnell Park, N., accountant; A. G. Mountford, The Power House, Tite Street, Chelsea, S.W., gentleman. Private company. The number of directors is not to be less than two or more than three; the first are J. St. V. Fox and A. G. Mountford (both permanent); qualification, five shares; remuneration, 5 guineas each per annum. Registered by W. J. Pitman, 11-12, Finsbury Square, E.C.

Improved Railway Signals, Ltd. (101,970).—This company was registered on March 12th, with a capital of £10,000 in £1 shares (7,000 deferred ordinary and 3,000 preferred ordinary), to construct, manage or control railways and tramways, the signalling systems and signals connected therewith, &c. The subscribers (with one share each) are:—A. Pettengill, 62, St. Martin's-le-Grand, E.C., secretary; R. Denial, 62, St. Martin's-le-Grand, E.C., clerk. Private company. The number of directors is not to be less than two or more than five; the first are B. Norman and J. W. Wilkinson; qualification (except first directors), £200; remuneration, £300 each per annum. Registered office, 62, St. Martin's-le-Grand, E.C.

British Medical Electric Appliances Co., Ltd. (101,940).—This company was registered on March 11th, with a capital of £250 in £1 shares, to carry on the business of electricians, engineers, manufacturers of and dealers in electrical, chemical, laboratory and other apparatus, &c. The subscribers (with 1 share each) are:—F. B. Brook, Effingham House, Arundel Street, W.C., solicitor; H. G. Davis, 7, New Square, Lincoln's Inn, W.C., solicitor. Private company. The number of directors is not to be less than two or more than five: the subscribers are to appoint the first; qualification, £20 shares or stock. Registered by H. G. Davis, 7, New Square, Lincoln's Inn, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Waterworks, Lighting and Power Investment Corporation, Ltd. (88,390).—Issues on February 1st of £200, and on February 25th of £10 debentures, parts of a series created August 18th, 1906, to secure £10,000. No trustees.

Van Raden & Co., Ltd. (78,383).—This company's annual return was filed on January 13th, when 6,654 shares had been taken up out of a nominal capital of £10,000 in £1 shares. £4,654 has been received and £2,100 is considered as paid. Mortgages and charges, £2,750.

Batley Electric Carbonizing Co., Ltd. (100,350).—Particulars of £7,000 debentures created February 12th, 1909, filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the whole amount being issued on same date. Property charged: The company's present and future property, including uncalled capital. No trustees.

Gell Telegraphic Appliances Syndicate, Ltd. (78,405).—This company's annual return was filed on January 26th, when 86,050 shares had been taken up out of a nominal capital of £10,000 in £1 shares. £1 per share has been called up on 6,050, and 10s. per share on 15,000, resulting in the receipt of £13,550, in addition to £337 10s. paid on 1,500 forfeited shares. £22,500 is considered as paid, being £1 per share on 15,000, and 10s. per share on 15,000. Mortgages and charges: Nil.

CITY NOTES.

Newmarket Electric Light Co., Ltd.

The directors' report for 1908 says that during the year 951 8-c.p. lamps have been connected to the mains, making 23,664 lamps. Applications for a further 208 lamps have been received this year. The whole of the works have been maintained in perfect working order. An additional engine and dynamo and a mechanical stoker have been put down at the generating station, and the buildings there have in consequence been enlarged. These additions have proved satisfactory in every way, and will, it is confidently expected, meet all requirements for some years to come. The revenue for the past year has fallen short of that of the previous year by about £116, partly in consequence of greater economy having been exercised by consumers, and partly on account of the number of houses closed during the year. The whole of the plant was specially overhauled during the year. The profit on working, added to £104 brought forward, amounts to £2,480, which, after providing for debenture interest, £710, leaves a balance of £1,770. The directors recommend the payment of a dividend of £4 per cent.; that £650 be carried to reserve for renewal of plant; and that the balance be carried forward.

Stock Exchange Notices. — The Committee have appointed a special settling day as under:—

Thursday, March 25th.—Rio de Janeiro Tramway, Light and Power Co., Ltd.—£1,200,000 5 per cent. 50-year mortgage bonds of £100 each, Nos. B 1 to B 12,000.

And ordered the undermentioned securities to be quoted in the Official List:—

British Columbia Electric Railway Co., Ltd.—Further issue of £100,000 5 per cent. cumulative perpetual preference stock.

Lisbon Electric Tramways, Ltd.—Further issue of 39,838 ordinary shares of £1 each, fully paid, Nos. 594,189 to 634,026.

Monterey Railway, Light and Power Co.—£1,000,000 5 per cent. first mortgage debenture stock.

Rio de Janeiro Tramway, Light and Power Co., Ltd.—£1,200,000 5 per cent. 50-year mortgage bonds of £100 each, Nos. B 1 to B 12,000.

Winchester Electric Light and Power Co., Ltd.

The directors' report for 1908 states that the progress which the company is making continues to be satisfactory; the equivalent of 2,150 8-c.p. lamps have been added during the year, making the total connection at the end of the year 56,641 8-c.p. lamps. Including the balance of £313 brought forward from last year's account, the statement shows a net profit of £7,331, which, after payment of debenture and loan interest, £2,050, and appropriating the sum of £250 directors' fees for the year ended December 31st, 1907, leaves a balance of £5,031 available for distribution. An interim dividend for the half-year at the rate of 5 per cent. per annum, amounting to £1,105, was paid in September last, and the directors now recommend that a dividend at the rate of 7 per cent. per annum be declared for the half-year, which will absorb £1,547, making 6 per cent. for the year; that £1,500 be placed to depreciation account, and that £600 be placed to reserve fund account, leaving £279 to be carried forward. The works and mains are in good working order.

Units generated	622,816
,, sold	519,585
,, not accounted for	8,103
,, used on works, &c.	95,178
Lamps connected	56,641

County of London Electric Supply Co., Ltd.

Mr. J. B. Braithwaite presided at Winchester House, Old Broad Street, E.C., on Monday, over the meeting of this company. In moving the adoption of the report (see Electrical Review, March 12th, page 440), the Chairman said the past year had been one of comparative smoothness. Turning to the revenue account, their receipts from the sale of current and from the rental of meters was £164,839, compared with £167,864, but the comparison on this occasion was not a very correct one. In the previous year they received £7,150 for supplying current to the London County Council tramways pending the completion of the Council's own generating station, and, therefore, if they excluded this exceptional item, their ordinary business showed an increase of £4,115 for the year. They had made up the net revenue account to within £3,000 of last year, notwithstanding the loss of supply to the L.C.C. They had taken £20,000 out of the revenue of the year for depreciation, which was equal to the amount they were distributing on their ordinary stock. With regard to the progress made during the year, the total applications received up to December 31st amounted to the equivalent of 1,085,192 30-watt lamps. If they had given these figures as 8-c.p. lamps, this would have been a record in the history of the company; but for good and sufficient reasons they were now counting their connections in 30-watt lamps, and so they apparently showed a reduction on last year. There had been an increase of 1,162 customers in the year, and the total number of customers was 13,645. The units sold were 13,610,760, as against 13,970,179 for the previous year, and, excluding the consumption taken by the L.C.C. tramways in 1907, the units sold during 1908 showed an increase of 11 per cent. Their prices were still exceedingly reasonable, and those who spoke of the electric lighting companies fattening on the unwilling public, could hardly realise the reasonableness of their prices. Their combined price for lighting and power was 2·86d. per unit. With regard to the technical side, he had told them on previous occasions that they had installed a number of turbo-generators in the stations, and he was glad to say that the recommendations of their engineer in this respect had been fully justified by the results. At the end of 1908 they had 10,000 kw. of turbine plant in use, which had enabled them to still further reduce their generating expenses. In 1905 five testing stations for recording the pressure of supply were erected at the request of the London County Council, and the weekly records taken had been reported by the L.C.C. as being very satisfactory. The total sales of current were 13,610,760 units, and the units sold for power purposes showed an increase of 1,269,357 over the previous year. It was rather interesting to see how steadily they maintained the proportion between light and power in this company; it being almost exactly half and half. The units sold for lighting showed the comparatively small increase of 87,259, and this was doubtless due to the light weather, and also to the introduction of the metal-filament lamp, which had been considerably developed during the year. For their part, they welcomed any improvement in lamps which would make electricity cheaper and more convenient for the ordinary consumer. The man who invented a lamp which would be more efficient, and give an equivalent amount of light at a lower cost, was a benefactor to the electric light industry. Although during the transition stage from one lamp to another, there might be some temporary falling off in revenue; in the long run, improvements of this kind which made electricity cheaper were to their interest. The works costs had been again mentioned at an exceedingly low level, viz, ·388d. a unit sold. As to the associated companies, the Bournemouth and Poole Co. had made good progress, and paid 6 per cent. for the year. In regard to Coatbridge and Airdrie also, great progress had been made, and they had sold 1,639,209 units, as against 1,055,557 units in the previous year. They had made arrangements for taking a bulk supply from the Clyde Valley Electric Power Co., which would have the effect of relieving them of further capital expenditure, which otherwise would have been necessary to increase the output at their station to cope with the increased demand. In conclusion, the Chairman referred to the defeat of the London and District Electricity Bill and to the passing of the London Electric Supply Act, and said that although he did not wish to be too sanguine on the subject, still he thought they had seen the last of these great competitive power schemes which had been launched for the last four or five years, and which had absorbed so much time and energy of their officials. He supposed their company had spent £20,000 in the last five years in protecting their interests in the matter. By the Bill which their company, in conjunction with others, had obtained, they would be able to link up their stations, and enter into agreements for mutual assistance. They would now be enabled to join up their stations in the City Road and at Wandsworth, and were negotiating with that object. He thought that by this Act, and perhaps a supplementary one, the producers of electricity in London could be able to prevent unnecessary waste, and would be able to carry on their business with the maximum of efficiency, which must be to the public interest. Owing to the large area of their own company, perhaps the Act would be of more benefit to them than to the others, and he was in hopes that they would be able to come to arrangements either for giving or taking electricity from those who were on their borders. At all events they would leave no stone unturned to utilise the powers given them in the interests of both the company and the public.

Mr. F. W. Reynolds seconded the motion, which was adopted without discussion.

The retiring directors were re-elected, and a vote of thanks was passed to the board and staff.

Brompton and Kensington Electricity Supply Co., Ltd.

The meeting of this company was held on Thursday of last week at Winchester House, Mr. H. R. Beeton presiding.

The Chairman, in proposing the adoption of the report (see Electrical Review, March 12th, page 440), said that the profit was £3,923 less than that of the previous year, representing a diminution of £2,521 in receipts and an increase of £1,402 in expenses. Of the diminution of £2,521 in receipts, about £1,000 was due to their having, at the suggestion of the auditors, taken their meter readings about five days earlier than in the previous year, and about £1,000 was due to the relative absence of fog as compared with 1907. When those corrections had been made there remained, however, a nominal deficiency in the receipts of about £500; and as the new business during the year amounted to about £1,500, the real deficiency in the receipts as compared with 1907 was about £2,000, or something under 4 per cent. on the gross revenue. Of the increase of £1,402 in expenses, £1,071 was due to exceptional repairs, and £247 to additional legal expenses. The exceptional repairs were explained by the fact that they had charged the revenue of the year with all the alterations required by the Home Office regulations in connection with the erection of a new switchboard, which they might have debited to depreciation; and the additional legal expenses were explained by the fact that they had charged the revenue of the year with the whole of their Parliamentary expenditure, which, having resulted in adding considerably to the value of the undertaking, they might have debited to capital. From these explanations it would be seen that the decrease of £3,923 in net revenue was not so serious as appeared on the face of it. Notwithstanding that, however, when all needful allowances had been made, the fact remained that there had been a real shrinkage of revenue amounting to about £2,000, which was quite unprecedented in the twenty years' history of the company and which it behoved them carefully to examine. The main cause of that decrease was, no doubt, the gradual introduction of metallic-filament lamps, for the possible effects of which the directors had prepared in the exceptional amounts carried forward and placed to the credit of special reserve account for three years past. Notwithstanding the falling-off in revenue, they were enabled, after making the usual provision for depreciation, but placing a smaller amount to special reserve and carrying forward rather a reduced balance, to pay the same dividend. With regard to their Parliamentary expenditure, large and protracted as it had been, it had achieved solid results, and he believed that they had practically seen the end of it. By the Act, which they, in conjunction with other of the London electricity supply companies, had obtained, although they had not got all they asked for, they had secured, among other things, the right to connect their mains with those of their neighbours, and they had also secured the benefit of simultaneous purchase; and what was even more important, by the rejection of the London and District Electricity Supply Co.'s Bill, they had removed, he trusted for ever, the danger of unfair and injurious competition which threatened them for so long. With regard to the metallic-filament lamp, to the consumer the lamp must be a benefit in any event, but its benefit to the supply company must depend upon the extent to which the consumer availed himself of the cheaper light to demand more of it. If by means of the metallic-filament lamp new business was obtained to compensate for the shrinkage of the old, as would generally, if not universally, prove to be the case, a supply company would do well to continue to give its consumers the benefit of the present low prices and to reduce them if possible. Such a course was sound commercial policy, and was the one which had always commended itself to the directors. Although consumers generally had become so accustomed to a continuous reduction in the price of electricity that they had come to regard it as almost inherent in the nature of things, a supply company was not necessarily called upon to acquiesce in a new development on terms which would deprive it of any share of the advantage due to such development, especially when in the past it had always shared the advantages due to the progress of invention with its consumers. Generally, if not universally, there could be no doubt that the electricity supply companies would be gainers by the

invention of the metallic-filament lamp. They had always possessed the best illuminant, and they were now by way of possessing the cheapest, with the result that they had every reason to congratulate themselves upon the prospect before them; but there was plenty to be done, both on the part of consumers and of the supply companies, if this latest improvement in electric lighting was to be effectively and economically applied. The removal of the prospect of wasteful and needless competition by the final rejection of outside enterprise, under the specious name of "bulk supply," in the last session of Parliament, and the further powers which had been conferred upon existing undertakers, left the companies and the local authorities free to develop their undertakings to greater advantage than ever before. Although the drawback of limited tenure remained to some extent, that of limited area had been largely removed, and they would now be able to rely upon a mutual reserve of power by "linking up," thereby minimising the risk of breakdown and economising capital, and in addition the less favoured stations would be able to derive their future supply from those whose area and location enabled them to produce electricity under the most advantageous conditions. As a consequence of this, steps were being taken to unify the system of electricity supply throughout the metropolis, whereby the value of the reversion of the London County Council would be largely enhanced, and as a further consequence a collective effort would be made to enable the supply authorities to cultivate a closer touch with their consumers, whereby their installations might be improved to the fullest extent of which modern methods would permit.

Mr. W. R. Davies seconded the motion.

Mr. W. B. Page criticised the accounts at length, and complained of the rapid way in which the expenses were increasing year by year. He asked that the board should pursue a more steady policy with regard to their expenditure. The Chelsea Co. had 18 per cent. of their total capital in the depreciation account, Westminster Co. 20 per cent., St. James's Co. 15 per cent, whilst theirs was as high as 33 per cent. He knew it was on the right side, but what was the good of storing up money for another generation.

Another Shareholder asked that the shareholders should be furnished with particulars of the quarterly sales of current.

The Chairman, in reply, said that their Parliamentary expenses were £504. He was aware that they only pledged themselves to the extent of £200 towards the cost of getting the combined Bill, but when the solicitors' costs came in they were found to be 150 per cent. above the estimates. They, however, did not demur at paying the extra £300, as he thought it was well worth it. Referring to the expenses, which Mr. Page had said had increased £3,000: Of that sum £1,000 was due to the exceptional repairs which they had paid out of capital, but they could have credited it to depreciation, and of the remaining £2,000, rates had accounted for £1,400, so that the increased expenses were not so great as they appeared at first sight. They had no objection to the information being given as to the progress of the company each quarter, but he thought shareholders could get all they wanted by seeing the secretary. As to the question of their depreciation, they never had allowed their policy to be regulated by what other companies did, and they never intended to do so.

The report was unanimously adopted.

Chelsea Electricity Supply Co., Ltd.

The annual meeting was held on Wednesday, March 10th, at Winchester House, Sir Irving Courtenay presiding.

The Chairman, in proposing the adoption of the report (see Electrical Review, March 5th, p. 399), said that, in view of the depression felt in most trades, which had had its effect on their business, they could not look upon the results for the year as unsatisfactory, for they were able to maintain the same dividend as last year, after placing the proper amounts to reserve. They had had a very hard fight during the year, and for several years past, before the Parliamentary Committees, and were glad to be able to record a satisfactory ending. The London and District Electricity Bill, which proposed to supply power to the whole of greater London and beyond, and consequently to make incursions into the territory of every established company, although passed by a Committee of the Lords last year, was thrown out by the Commons. The London Electric Supply Bill, promoted by nine existing companies, including their own, was passed, as also was a Bill promoted by the four remaining London companies, the London (Westminster and Kensington) Electricity Supply Companies' Bill. The London Electric Supply Companies' Act gave powers of association and inter-supply between all the companies and local authorities supplying electricity in the County of London. It allows the companies to give a supply for haulage and traction, which might be used outside their areas of supply, and there was a clause permitting the companies to make reasonable restrictions in regard to a consumer requiring a supply merely as a stand-by. After the clause permitting association, perhaps the most important was that which gave the County Council powers to purchase the companies, in the place of the former powers of the local authority. Compulsory purchase could not take place until 1931, and three years' previous notice of intention to purchase must be given. During those three years the Council could be required to grant loans to the companies for necessary and approved capital expenditure. The clause gave their company three years longer life than it had under its provisional order, and there was a further provision that the undertakings of all the companies must be purchased at the same time. That was important, as it prevented the possibility of one undertaking being purchased alone, and made use of to compete, by the aid of the rates, with another undertaking, with consequent depreciation of the value of the latter undertaking. They were justified in believing that the Parliamentary struggle was now over, and that there was an end to the detrimental effect which the element of uncertainty had exercised for so many years, on the value of electric supply shares. It now remained for the companies to work out a scheme for taking advantage of the provisions of their Acts, and this would take some little time. Their company was not so situated as to be able to give large supplies in bulk, but there were several companies whose generating stations were more favourably situated, those, for instance, on the river, and if in the future they were able to give them a sufficiently cheap supply it would save them much capital expenditure, and be greatly to the interests of their business. With considerable effort and persistent canvassing, they had succeeded in increasing the number of lamps on their circuits by 10,375, and the units sold by 105,980; the revenue from current had also increased by £1,411. There was a small increase in the expenses, and the price obtained per unit was a little lower. The total expenses per unit, however, were much the same, showing a slight decrease. They had managed to place about £15,000 in investments of a nature which fluctuated but little, and expected to add to these, until money was required for further appreciable capital expenditure. The new metallic-filament lamps had been adopted to a considerable extent by many of their customers, and it was satisfactory to find that there had been some increase in the output of units notwithstanding this fact. In certain cases no doubt there would be a reduced amount of current used, but in other cases the efficiency of the new lamps would lead to an increased demand for light. There was little doubt that the perfecting of the metallic-filament lamp enabling low candle powers to be used on a 200-volt circuit, would eventually bring the use of electric light within the reach of the smaller residences, since the cost by the use of such lamps would compete well with gas; but the process would be gradual.

Major Woods seconded the motion, and the report was adopted.

Guildford Electricity Supply Co., Ltd.

The directors' report for 1908 first records the death—in May last—of the Chairman of the company, Dr. F. R Russell. During the year the company made very satisfactory progress, the gross receipts being £6,773, as compared with £6,467 for the year 1907, thus showing an increase of £306, which the directors consider is very satisfactory in view of the introduction of metal-filament lamps, which have the effect of considerably reducing the receipts per consumer; but they are confident that the introduction of these lamps, and the consequent cheapening of the electric light, will ultimately result in considerably increasing the number of the company's consumers. The directors also report an increase in the connections for motive power. There is a balance on the revenue account of £3,168 (after crediting depreciation fund account with £1,000), as compared with a balance of £2,932 (after crediting depreciation fund account with a like amount) on the revenue account for 1907. After making due provision for interest on debentures, dividend on preference shares, and the placing of £400 to the credit of reserve fund account, the net revenue account shows a balance of £998 for distribution. Out of this the directors recommend a dividend at the rate of 5 per cent. for the past year on the ordinary share capital of the company, which will absorb £698, leaving £301 to be carried forward. The following table shows the progress of the business:—

Year.	Consumers.	Revenue.	Total costs.	Gross profit.
1906	525	£5,975	£2,524	£3,451
1907	588	£6,467	£2,534	£3,933
1908	661	£6,772	£2,604	£4,168

The total capital expenditure up to December 31st, 1908, amounts to £57,807, and the total capital receipts are £52,686; there is, therefore, a balance over-expended of £5,121. During the past year a new Diesel oil engine and also a dynamo have been laid down to meet the needs of the increasing business, and further capital is therefore required to meet the cost of these new plant extensions. Mr. J. A. C. Younger has been elected a director to fill the vacancy caused by the retirement of Mr. C. J. Scott. Dr. J. P. A. Gabb was elected a director in place of the late Dr. F. R. Russell. The following is a statement of electricity sold, &c.:—

	1908.	1907.
Lighting	244,204	236,694
Power and heating	90,528	68,165
Total	334,732	304,859
H.P. of motors connected	346	270
Total number of consumers	661	588

South London Electric Supply Corporation, Ltd.

The report of the directors for 1908 states that the gross receipts for the year have been £37,015, while expenditure has been £17,817, leaving a profit balance of £19,198; adding the amount brought forward, £2,479, there is a total amount available of £21,677; after providing for depreciation and interest on temporary loan from bankers, &c., £6,907, there remains to be carried to the general balance-sheet £14 770. Out of this the board recommend the payment of a dividend at the rate of 5 per cent. per annum on the ordinary shares, amounting to £13,000, carrying forward a balance of £1,770. At the end of 1908 there were connected to the company's mains the equivalent of 187,961 8-c.p. lamps, showing the

substantial net increase for the year of 25,696 8-c.p. lamps. In addition, applications were in hand for 4,600 lamps not then connected to the circuit. During the year under review the plant, machinery and mains have been maintained out of revenue in a high state of efficiency. From the prospectus circulated in December last, they would have observed that subscriptions were then invited for an issue of £100,000 5 per cent. first mortgage debenture stock at par (part of a total authorised issue of £130,000), the total amount offered being subscribed. The proceeds of this issue had since been applied in payment of an overdraft with the company's bankers, which at the end of the year stood at £31,882, the balance, after deducting the underwriter's charges, being available for the extension of the company's undertaking as required. The readjustment of the various capital accounts referred to twelve months ago, and rendered necessary by the general order made by Mr. Justice Neville on March 14th, 1908, to reduce the share capital of the company by the sum of £65,000, has now been completed. The units sold, which amount to 3,182,820, show an increase of 521,366, or 19·6 per cent. in excess of the previous year—the total costs per unit sold being 1·34d., as against 1·64d. in 1907—a reduction of 18 per cent. The ratio of total costs to revenue was last year 48·2 per cent. On the grounds of continued failing health, Mr. George Ellis has resigned his seat on the board; Mr. John Macdonald Henderson, M.P., has been appointed to the vacant seat. The following is a statement of electricity generated, sold, &c.:—

Units generated	4,061,860
Sold to consumers and used by public arc lamps	3,182,820
Used on works for lighting, meter testing and motors	256,700
Total	3,439,520
Quantity expended in distribution	622,340
Lamps on circuit (8 c.p.)	187,926

British Insulated and Helsby Cables, Ltd.

The directors' report for 1908 shows that there was a profit of £193,832, plus £28,335 brought forward, making £222,167. From this have to be deducted directors' and debenture trustees' fees, and remuneration to works committee, less directors' fees receivable from other companies, £4,497; interest on debenture stock, £22,500; transfer to reserve account, £10,000; transfer to special reserve account, £17,000; transfer to patents and goodwill account, £27,166; transfer to debenture stock redemption account, £5,000; transfer to tools and drums account, £5,000; dividend on preference shares to December 31st, 1908, £30,000; interim dividend on ordinary shares to June 30th, 1908, £20,000=£141,163; leaving available for dividend a balance of £81,004. The directors recommend the payment of a further dividend of 6s. per share on the ordinary shares, making with the interim dividend already paid a total of 10 per cent. for the year ended December 31st, 1908, £30,000, carrying forward £51,004. During the past year the volume of trade has been in excess of the previous year, and the directors consider the result of the year's working satisfactory. The directors decided that it was advisable to have a re-valuation of the company's freehold and leasehold properties, plant, machinery, &c., in view of the fact that this had not been done since 1897, and they employed Messrs. Fuller, Horsey, Sons and Cassell, London, for that purpose. The amount standing in the company's books at December 31st, 1908, including loose tools, drums, and outlying property, and additions for the year 1908, is £505,892. The property re-valued, which does not include loose tools, drums, and outlying properties, amounts to £511,698. Adding the loose tools, drums, &c., after deducting depreciation, £45,529, the same assets will now stand in the books at £557,227. The difference of £51,334, together with £27,166 transferred from profit and loss account, has been appropriated for the purpose of writing down patents and goodwill, which now appear in the balance-sheet at £71,500. A sum of £10,000 has again been transferred to reserve account, £17,000 to special reserve account, a further £5,000 to debenture stock redemption account, and the amount carried forward is £51,004. The two directors who retire at the general meeting are Mr. E. K. Muspratt and Mr. S. Z. de Ferranti. The latter has notified the board that he does not intend to seek re-election, which the directors regret. The Hon. Arthur Stanley, M.P., has recently been elected a director.

Newcastle and District Electric Lighting Co., Ltd.

The annual meeting of this company was held in Newcastle on 11th inst.

Mr. John B. Simpson moved the adoption of the report (see Electrical Review, March 5th, page 393), and said that he desired to emphasise what had already been stated in the report—that depression in the steel and other trades, protracted strikes, which lasted three quarters of the year, and the extended use of metal-filament lamps, all combined in preventing an increase in revenue which naturally might have been expected. Depression in trade was still with them, and some time might elapse before the full benefit of any change could be felt, but the cessation of the strikes had already considerably increased the output of the company, and in the meantime everything possible was being done to push the sale of electricity for lighting and other domestic purposes in order to compensate for the loss in sales due to the more efficient lamp already mentioned, the effects of which had been felt by all electric lighting undertakings throughout the country. During the first two months of this year, however, he was pleased to say that there had been a satisfactory increase in the number of units sold as compared with the same two months of last year. He referred to the loss sustained by the company in the death of Mr. J. W. Spencer, who was one of the original shareholders and a director for five years. Sir Charles S. Milburn, son of the late chairman of the company, had been elected a member of the board during the year.

Mr. H. I. Brackenbury seconded the adoption of the report, and the dividend was agreed to.

London United Tramways, Ltd.

The directors' report for 1908 says that the operation of the company's undertaking during that period resulted in gross receipts amounting to £348,390, and the working and general expenses, maintenance and repairs to £220,232, leaving, with the balance brought forward from last account, a net revenue of £129,445. After payment of interest on debenture stock and loans for the year, and the payment of the dividend of 5 per cent. per annum on the preference shares for the first half-year, and providing for income-tax, there remains a balance of £30,171. Although this amount would have sufficed for the payment of the full dividend of 5 per cent. on the preference shares for the second half-year, the directors feel that the preference dividend should be limited to 2½ per cent. per annum for the present with a view to making provision for future renewals and the strengthening of the reserve funds, as stated in their circular of December 31st last. A dividend of 2½ per cent. per annum for the half-year ending December 31st has, therefore, been paid on account of the 5 per cent. cumulative preference shares, making 3¾ per cent. for the year, and the directors now propose to place £15,000 to the reserve fund for renewals, and to carry the balance of £327 forward. With the amount now added, the reserve funds will total £39,168. The gross receipts show an increase of £2,820, and the total number of passengers carried was 59,255,919, an increase of 529,939. The Bill promoted by the company in the last session of Parliament received the Royal Assent on August 1st. Under this Act the company has been successful in at length securing Parliamentary authority to establish tramways across Kew Bridge, and by that means effect the much-needed connection between the trunk system on the Middlesex side and the royal borough of Richmond. During the present year the question will arise as to the company being required to sell to the local authority the four lengths of tramway within the borough of Hammersmith. Although short in length, varying between one mile and one and a half miles only, these four portions of tramway are very important as forming the eastern terminals of the company's main lines, and are all worked as parts of through routes. Any interference, therefore, with the company's possession would result in the public being deprived of the valuable privileges and services they now enjoy, so that, in the exceptional circumstances of the case, the directors have deposited a Bill in Parliament to postpone the period for any acquisition by the local authority. Under the Bill powers are also sought for mutual running facilities over some of the tramways of the company and the London County Council respectively that lend themselves to being operated as through routes for the greater convenience of the public.

Victoria Falls Power Undertaking.—The directors of the Dresden Bank, in the course of their report for 1908, state that the 5 per cent. bonds in the Victoria Falls Power Co. which the bank took over in conjunction with the other members of the financial syndicate of the Allgemeine Elektrizitäts Gesellschaft, had been successfully introduced on the Stock Exchange, and had in the meantime been fully negotiated. The company in question has now concluded important contracts for the supply of power, and intends to erect a further extensive station on the Witwatersrand. It is proposed to provide the means for this purpose again by the emission of half the amount in preference shares and half by the issue of bonds, the latter of which will be taken over by the financial syndicate of the Allgemeine Co. and the financial powers associated with the Siemens-Schuckert works, seeing that a co-operaton of these two electrical companies is foreseen this time for the work. The allocation of the construction to German companies, according to the directors of the bank, is noted as a new and important success of German home industry.

Fairbairn, Lawson, Coombe Barbour, Ltd.—The profit for the year, after charging expenses incidental to the business (including depreciation, £16,778), amounted to £190,997, against £115,804 a year ago. The directors recommend a dividend at the rate of 10 per cent. per annum on ordinary shares for the half year to December 31st, making with the interim dividend 7½ per cent. for the year, and a bonus of 5 per cent. on the ordinary shares. There is transferred to reserve fund £75,000, leaving £46,816 to carry forward.

British Engine, Boiler and Electrical Insurance Co., Ltd.—A dividend of 4s. 6d. per share, and a bonus of 2s per share, free of income-tax, for the half-year, are declared, making 9s. 6d. per share for the year. £8,000 is put to reserve.

Liverpool District Lighting Co., Ltd.—The directors recommend a final dividend at the rate of 3 per cent. per annum, making 4 per cent. for the year.

Rosario Electric Co., Ltd.—For the past half-year an interim dividend of 6 per cent. per annum (3s. per share), less income-tax, on the ordinary shares is announced.

MARKET QUOTATIONS.

Wednesday, March 17th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	„	28/-	..
a „ Sulphuric	„	5/6	..
a Ammoniac, Sal	„	42/-	..
a Ammonia, Muriate (crystal)	per ton	£33 10	..
a „	„	£30	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16	..
a Copper Sulphate	„	£20	£1 dec.
a Lead, Nitrate	„	£23 10	..
a „ White Sugar	„	£23 10	..
a „ Peroxide	„	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a „ Chlorate	per lb.	3½d.	..
a „ Perchlorate	„	9d.	..
a Potassium, Cyanide	„	7d.	..
a Shellac	per cwt	77/-	8/- dec.
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5	..
a Soda, Caustic (white 70 %)	„	£10 15	..
a „ Chlorate	per lb.	3½d.	..
a „ Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
a „ Cyanide (basis 100 %)	„	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£70	..
b „ Wire, in ton lots	„	£112	..
b „ Sheet, in ton lots	„	£120	..
p Babbitt's metal ingots	„	£50 to £135	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7¼d.	¼d. dec.
c „ Tube (brazed)	„	8¼d.	¼d. dec.
c „ „ (solid drawn)	„	7¼d.	¼d. dec.
c „ Wire, basis	„	6¾d.	¼d. dec.
c Copper Tubes (brazed)	„	9d.	¼d. dec.
c „ „ (solid drawn	„	9d.	¼d. dec.
g „ Bars (best selected)	per ton	£69	£2 dec.
g „ Sheet	„	£69	£2 dec.
g „ Rod	„	£69	£2 dec.
e „ (Electrolytic) Bars	„	£58	£2 dec.
e „ „ Sheets	„	£74 10	£2 dec.
e „ „ Rod	„	£62 10	£2 dec.
e „ „ H.C. Wire	per lb.	7⅞d.	1/16d. dec.
f Ebonite Rod	„	3/3	..
f „ Sheet	„	3/-	..
n German Silver Wire	„	1/6	..
h Gutta-percha, fine	„	5/6 to 6/6	..
h India-rubber, Para fine	„	5/3	¼d. inc.
i Iron Pig (Cleveland warrants)	per ton	46/-	1/3 dec.
l „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Ingot	„	£13 10	5s. dec.
m Manganin Wire No. 28	per lb.	8/-	..
g Mercury	per bot.	£8 7 6	..
d Mica (in original cases) small	per lb.	6d. to 1s.	..
d „ „ „ medium	„	2/6 to 4/-	..
d „ „ „ large	„	4/6 to 8/6	..
p Phosphor Bronze, plain castings	„	1/- to 1/1	..
p „ „ rolled bars & rods	„	1/1½ to 1/3	..
p „ „ rolled strip & sheet	„	1/2½ to 1/6	..
o Platinum	per oz.	100/-	variable.
e Silicium Bronze Wire	per lb.	9½d.	..
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£129 10 to £130 10	£1 dec.
n „ Wire, Nos. 1 to 16	per lb.	1/9	..
p White Anti-friction Metals:—			
"White Ant" brand	per ton	£35 to £60	..
k Zinc, Sh't (Vielle Montagne bnd.)	„	£25 15	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

Smithfield Markets Electric Supply Co., Ltd.—The directors' report for 1908 shows a gross profit of £3,921 compared with £5,195 for 1907, and the net profit is £1,989 compared with £3,337. The reduction in profit is due to the increased cost of coal and the smaller number of lighting units sold, although the total output exceeded that of 1907. The total amount now standing to the credit of reserve and depreciation fund account (including the above net profit) is £20,386. Arrangements have been made for an auxiliary supply of current by means of motor-generators, and it is hoped that the generating costs may be lower in consequence. The expenses in connection with the installation have been charged to the general reserve fund account. The plant and machinery have been fully maintained out of revenue and the supply of current for power and lighting has been efficiently given.

Bukit Rajah Rubber Co.—An ad-interim dividend for the year 1908-9 of 12 per cent., less tax, is announced.

Prospectus.—*Rubber Plantations Investment Trust, Ltd.*—For carrying on the business of an investment and trust company and for developing the rubber industry in the Middle East, this company has been formed with £500,000 capital; £250,000 in £1 shares has been offered for subscription this week.

STOCKS AND SHARES.

Tuesday Afternoon.

Markets have come entirely beneath the shadow of the Balkans question. Upon the news that comes in prices move. Investment business there still is, but it has shrunk to narrow dimensions, and no doubt the wholesale supply of new issues since the beginning of the year is one reason why the public are not investing much in the markets now.

Electrical descriptions are so quiet as to be well nigh stagnant. Were it not for the marking *ex* dividend of a good many prices last account day, our price lists this week would record exceedingly few alterations.

One of the movements that stands out prominently is a marking down of 4½ points in Brush Electrical Second Debenture stock. The price has been put back to 35½, but even so it is very nominal, and there is hardly any market. British Electric Tractions weakened on account of the death of Mr. H. O. Arnold-Forster, M.P., who was a director of the company. The preference are ¼ lower, and the Ordinary lost ⅛, while the First Debenture stock fell a point.

Allowing for the dividend deductions, there are few changes of importance in the electricity supply catalogue. The principal is a shrinkage of half-a-crown in South Metropolitan Electric Light and Power Ordinary, the dividend being the usual sixpence a share. Amongst the London shares which became *ex* dividend last Friday, and the amount per share, there are the following:—

Share.	Divd. s. d.	Share.	Divd. s. d.
Brompton Ordinary	5 6	Metropolitan Ordinary	3 0
Do. Preference	3 6	Notting Hill	8 0
Chelsea	2 6	South London Ordinary	0 6
Kensington Ordinary	4 0	Do. Preference	0 8⅔

Hove shares are harder, so are Oxfords. Victoria Falls Power Preference fell to 17s. 6d. upon an outbreak of general weakness in the Kaffir market. A rise of a point in Urban Debenture stock is too rare an occurrence to be ignored.

The pendulum has swung downwards in the case of the Mexican-Canadian group, and prices are easier all round. The fall is due more to the uneasiness caused by the political situation than to any direct cause affecting the companies. Mexican Light and Power Common stock and the 5 per cent. bonds are easier, and the drop has been more emphatic in Mexico Tramways Common stock. The bonds of the latter are lower at 91. Rio Tramways at 97½ showed a loss of 6 points. Sao Paulo Tramway Light and Power eased off to 157½, the 5 per cent. bonds being 100½, while Rio Fives are 92½. A good deal of business goes on in the 4½ per cent. Perpetual Mortgage Debenture stock of the Shawinigan Water and Power Co.; the price is 96, and the capital stock stands 2½ points higher. Canadian General is quiet at 110 and the Preference at 115. Toronto Power 4½ per cent. Debenture stock, redeemable in 1918, changed hands this week at 99.

River Plate Electricity shares, both Ordinary and Preference, have advanced, the cause being the advent of dividend time in each case. Upon these shares the dividends are, of course, paid annually, and if the Board wished to popularise them as an investment, they could adopt no better plan than that of making the distributions every six months, as is done in the vast majority of instances.

Interest in the Electrical Railway group declined to be stimulated by the decision of the Central London to adopt penny fares on parts of the journey. The company's stocks did not move. There was a doubt expressed whether prices ought to be put up or put down, on the announcement. Prices of the other underground stocks are hibernating. Underground Electric Railways of London 5 per cent. prior lien bonds are ½ better, the rise bringing the price up to par, but the Income bonds fell to 28. Metropolitan Consolidated shed a point, and Districts are ¼ down. On the other hand, City and South London Ordinary shows an advance of ½, to 27½, the low price to which the stock has fallen leading to a little attention being drawn to it.

Anglo-Argentine Tramways are a stronger market, but other tramway descriptions show few features of interest. London United Tramways Preference shares and Debenture stock have not been affected by the issue of the report, which announces the directors' decision to keep the Preference dividend at 2½ per cent. for the time being.

Industrial shares are steady. Telegraph Constructions, *ex* 24s., are down no more than half a sovereign. British Insulated Ordinary shares hardened upon the issue of an excellent report, telling of substantial progress. Callender's gained 5s., and Henley's are 12, *ex* the dividend of 10s. 3d.

In the Telegraph list, the alterations are without significance. National Telephone descriptions show a disposition to weaken. The Trust Companies' stocks are steady.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Mar. 9th.	Closing Quotations Mar. 16th.	Business done week ended Mar. 16th, 1909. Highest	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	2⅜ — 3¼	2⅜ — 3¼	..	..	..	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	5 %	92 — 95	92 — 95	..	..	..	5 6 5
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	8 %	8 %	..	131½—132½	131½—132½	..	..	..	6 0 9
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	95 — 97	96 — 98	..	..	+1	4 1 8
598,180	Anglo-American Telegraph	Stock	3½%	3½%	3½%	£3 4s.	55 — 58	55 — 58	..	..	..	5 5 8
3,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	99 —101	99 —101	99⅝	99½	..	5 18 10
3,200,910	Do. do. do. Deferred	Stock	½%	1¾%	1 %	8/-	13⅜— 13⅝	13½— 13⅝	13⅝	13⅛	— ⅛	3 15 0
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	100 —102	98 —100	..	..	..	5 0 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7¾— 8⅜	7¾— 8⅜	..	..	..	4 15 6
2,431,350	Commercial Cable Stng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	85 — 87	86 — 88	87½	86½	+1	4 13 0
16,000	Cuba Telegraph	10	5 %	5 %	6 %	..	7⅞— 8⅛	7⅞— 8⅛	..	..	..	6 6 4
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½— 17½	16½— 17½	..	..	..	5 14 8
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	8 — 8¼	8 — 8¼	..	..	..	5 14 8
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 8 1
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	99 —102	100 —102	..	..	+ ½	8 16 6
60,710	Direct United States Cable	20	4½%	4½%	4½%	4½%	12½— 12⅝	12½— 12⅝	12½	12½	..	7 9 3
48,000	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	99½—101½	100 —102	..	..	+ ½	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	..	128 —131	128 —131	129½	128⅝	..	5 6 10
2,000,000	Do. 8½ % Pref. Stock..	100	8½%	8½%	8½%	..	84½— 86½	85 — 87	86	..	+ ½	4 0 6
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103½—105½	103½—105½	104	..	..	3 17 8
800,000	Eastern Extension, Australasia, and China Tele	10	7 %	7 %	7 %	..	12 — 12⅛	11⅞ — 12⅛	12 7/32	11 13/16	— ⅛	5 13 4
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	101¼	100⅝	..	* 3 18 5
200,000	East & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100½—102½	100½—102½	..	..	..	3 18 1
181,127	Globe Telegraph and Trust	10	5⅛%	5⅛%	5⅛%	..	10½— 10⅝	10½— 10⅝	10⅝	10 1/16	..	5 9 8
181,127	Do. do. 6 % Pref...	10	6 %	6 %	6 %	..	13 — 13½	13 — 13½	13⅛	13	..	4 8 11
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	..	30 — 32	30 — 32	32	..	..	6 5 0
14,000	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	99½—101½	100 —102	..	..	+ ½	4 8 8
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	..	52 — 55	52 — 55	..	..	..	6 18 11
$41,880,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	74 — 78	70 — 77 xd	..	..	..	5 3 11
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	71 — 74	70 — 75 xd	..	..	..	5 6 8
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	3/16 — 7/16	3/16 — 7/16	16/10½	15/9	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	3/32 — 5/32	3/32 — 5/32	18/6	..	..	6 0 9
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	3/32 — 5/32	3/32 — 5/32	..	..	— 3/32	5 14 3
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	109 —111	105½—107⅛ xd	109½	105½	..	5 11 7
5,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	122 —124	118 —120 xd	122½	117⅛	..	5 0 0
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 11½	10½— 11½ xd	..	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	5 %	6 %	6 %	10½— 11½	10½— 11½ xd	..	..	..	5 6 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅛— 5⅜	5⅛— 5⅜xd	5⅞	5⅜	..	4 8 11
2,000,000	Do. do. 3½ % Deb. Stock Red, ..	Stock	3½%	3½%	3½%	3½%	98 100	98 —100	100⅜	..	..	3 10 0
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	99¼—101¼	99¼—101¼	100⅝	100½	..	3 18 10
179,318	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	..	1 1/16 — 1 1/16	1 1/16 — 1 1/16	27/6	..	..	5 17 3
50,000	Do. do. 6 % Cum. Pref... ..	1	6 %	6 %	6 %	..	1⅛ — 1½	1⅛ — 1½	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	..	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
11,889	Reuter's	8	5 %	5 %	5 %	..	7½— 8½	7½— 8½	..	..	..	4 17 7
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
3,083	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6½— 7	6¾— 7	..	..	..	5 14 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4½— 5⅝	4½— 5⅝	..	..	..	4 13 0
80,008	W. Coast of America, 1 to 80,000 & 58,001 to 63,008	2½	Nil	2½%	2½%	..	1½— 1⅝	1½— 1⅝	..	..	..	3 11 5
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	12⅞— 13⅜	12⅞— 13⅜	13⅛	13	..	5 4 8
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	102½	..	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	15/16 — 1	15/16 — 1	..	..	..	Nil
84,568	Do. do. 6 % Cum. 1st Pref.	10	5 %	8 %	6 %	6 %	7⅞— 8⅛	7⅞— 8⅛	..	..	+ ⅛	7 3 3
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	..	7⅞— 8½	7⅞— 8½	..	..	..	4 14 1
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,007	5	8 %	8 %	9 %	..	8 1/32 — 9 1/16	8 1/32 — 9 1/16	9 1/16	8 1/32	..	4 12 11
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5⅛%	5⅛%	5⅛%	..	5⅞— 6⅛	5⅛— 6⅛	6 1/16	6	+ 1/16	4 12 4
266,600	Do. Old, 6 % Deb. Stock, 1888 ..	100	6 %	6 %	6 %	6 %	..	..	..	..	..	4 4 6
385,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —104	102 —104	102	..	..	4 16 2
580,000	Babcock & Wilcox, 1 to 580,000..	1	20 %	20 %	20 %	..	4 3/16 — 4 5/16	4 1/4 — 4 3/8	87/6	88/3	+ 1/16	4 13 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 3/16 — 1 5/16	1 3/16 — 1 5/16	..	..	..	3 18 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	..	1⅞ — 2	1⅞ — 2	..	..	..	17 10 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3¼— 3⅜	3¼— 3⅜	..	..	..	8 12 5
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	3⅞— 4⅛	3⅞— 4⅛	76/3	..	..	7 1 2
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3¼— 4⅛	3¼— 4⅛	..	..	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	96 — 98	96 — 98	..	..	..	5 12 3
500,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	6 %	8 %	8 %	137 —140	138 —141	..	..	+1	5 13 6
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	5 %	6 %	119 —124	120 —124	..	..	+ ½	4 16 9
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	105 —107	105 —107	106⅜	106	..	4 15 3
288,000	Do. 4½ % 1st Mort. Debs., 1 to 6,350 ..	40	4½%	4½%	4½%	4½%	102½—104½	102½—104½	..	..	..	10 15 3
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
188,301	British Electric Traction	10	3 %	Nil	Nil	..	1⅜ — 1⅞	1⅛ — 1⅜	..	..	— ⅛	Nil
161,487	Do. do. 6 % Cum. Pref.	10	6 %	6 %	3 %	..	3⅝— 3⅞	2⅝— 3⅜	65/-	60/-	— ⅛	8 17 9
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	90 — 95	89 — 94	91	90	—1	5 6 5
525,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	73 — 75	73 — 75	..	..	..	6 0 1
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	10 %	6⅞— 7⅛	6⅞— 7⅛	..	..	+ ⅛	6 17 11
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6⅛— 6⅜	6 — 6⅛	..	..	— ⅛	4 14 1
600,000	Do. do. 4½ % 1st Mort. Deb. Red.. ..	100	4½%	4½%	4½%	4½%	104 —107	104 —107	..	..	..	4 4 1
905,440	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	91 — 96	91 — 96	..	..	..	4 18 11
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	..	1/16 — 2/16	1/16 — 2/16	..	..	..	Nil
1,016,853	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	39 — 44	39 — 44	41½	..	..	9 1 10
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	9/16 — 11/16	9/16 — 11/16	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	2½%	Nil	Nil	..	0 — ¼	0 — ¼	..	..	..	Nil
300,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	..	1/16 — 3/16	1/16 — 3/16	..	..	..	Nil
125,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	..	57 — 62	57 — 62	..	..	..	7 5 2
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	..	38 — 42	38 — 38	..	..	—4½	10 16 10
187,610	Calcutta Trams, 1 to 187,610	5	8 %	8 %	6 %	..	4½— 5	4½— 5	..	..	..	6 0 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,880..	5	5 %	5 %	5 %	5 %	4⅝— 5⅜	4⅝— 5⅜	..	..	..	4 13 0
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9½— 10½	9½— 10½	..	..	..	7 6 4
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5½— 5⅝	5½— 5⅝	..	..	..	4 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107	105 —107	..	..	..	4 4 1
491,222	Cape E Trams., 1 to 491,222	1	Nil	Nil	Nil	..	1/16 — 3/16	1/16 — 3/16	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1½ — 1⅝	1⅝ — 1⅞	32/9	..	..	6 17 2
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	103 —107	103 —107	..	..	..	4 4 1
1,896,610	Central London Railway, Ord. Stock..	Stock	4 %	4 %	3 %	3½%	63 — 65	63 — 65	64½	63½	..	5 3 2
658,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	82 — 84	82 — 84	83⅜	..	..	4 15 3
658,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	45 — 47	45 — 47	46	..	..	5 2 0
1,480,000	City and South London Railway	Stock	1¾%	2¾%	2¾%	1¾%	26½— 27½	27 — 28	27½	..	+ ⅛	5 7 2
85,000	Crompton & Co., Nos. 1 to 85,000	8	2½%	5 %	5 %	5 %	1 — 1½	1 — 1½	..	..	..	11 2 2
130,000	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	96 — 99	96 — 99	..	..	..	5 16 1 0

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued.*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Mar. 9th.	Closing Quotations Mar. 16th.	Business done week ended Mar. 16th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1½ – 1⅝	1⅝ – 1½	..	..	– 1/16	8 0 0
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1⅛ – 1¼	1⅛ – 1¼	24/4½	..	..	4 16 0
276,880	Do. do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	101 –104	101 –104	..	..	..	4 6 7
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6 %	6¼ %	6 %	11⅛ – 12⅛	11⅛ – 12⅛	..	..	..	4 16 0
60,000	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12⅛ – 13⅛	12⅛ – 13⅛	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	4½ %	4½ %	4½ %	..	7/8 – 15/16	7/8 – 15/16	..	..	..	16 15 8
17,189	Do. "A" shares, 01—017,189	5	4½ %	4½ %	4½ %	..	1⅛ – 2⅛	1⅛ – 2⅛	..	..	..	8 6 9
317,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	75 – 78	75 – 78	..	..	..	5 2 7
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	86 – 89	86 – 89	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	5/16 – 7/16	5/16 – 7/16	..	..	..	Nil
81,890	Do. do. 7 % Cum. Pref., 1 to 81,890	2	7 %	7 %	7 %	7 %	1⅛ – 1⅜	1⅛ – 1⅜	..	..	..	9 6 9
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7½ – 7⅝	7½ – 7⅝	..	..	..	6 9 0
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	85 – 89	85 – 89	..	..	..	4 9 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	½ %	Nil	⅛ – ¼	..	..	..	..	3 6 8
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10⅛ – 10⅜	10⅛ – 10⅜	..	..	..	6 10 3
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 –103½	102 –103	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15 %	15%	15 %	12 – 13	11⅛ – 12⅛	..	..	– ½	6 0 0
40,000	Do. do. 4½ % Pref.	5	4½ %	4½ %	4½ %	4½ %	5 – 5⅛	5 – 5⅛	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	106 –108	106 –108	..	..	..	4 3 4
50,000	India-Rubber, Gutta-percha & Telegraph Works.	10	10%	10 %	10 %	..	15⅛ – 16⅛	15 – 16	..	..	– ½	6 5 0
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	½ %	Nil	1 – 1⅛	1 – 1⅛	..	..	..	5 6 8
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	4⅛ – 5⅛	4⅛ – 5⅛	..	..	..	9 10 6
600,070	London United Trams. (1901), 1 to 60,007	10	3 %	3 %	3 %	..	6⅛ – 6⅜	6⅛ – 6⅜	..	..	..	4 8 11
399,980	Do. do. 60,008 to 100,000	10	3 %	3 %	3 %	..	6⅛ – 6⅜	6⅛ – 6⅜	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	..	4⅛ – 4⅜	4⅛ – 4⅜	..	..	..	10 10 6
1,331,060	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	76 – 81	77 – 81	78½	..	..	4 18 9
5,782,062	Metropolitan Consolidated	100	2¾	1	1⅛	1⅛	35 – 36	35 – 36	35 7/8	35½	..	1 7 9
2,640,914	Do. Surplus Lands	100	2¾	2¾	2¾	2¾	69 – 71	69 – 71	69⅞	69	..	3 17 6
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	13⅜ – 14⅜	13⅜ – 14	13⅞	13½	– ¼	Nil
814,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	..	3/32 – 5/32	3/32 – 5/32	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	29/32 – 31/32	29/32 – 31/32	..	..	..	5 19 5
600,000	Do. do. 4½ % Deb. Stock Red.	100	4½ %	4½ %	4½ %	4½ %	93 – 96	93 – 96	94⅜	94½	..	4 13 9
$6,000,000	Mexico Trams Co., Common Stock	..	..	..	..	..	136¾–138½	134 –136	138¼	134	–2½	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	5 %	93¼ – 94⅛	90⅞ – 91⅛	91⅛	90⅜	..	5 9 3
245,500	Potteries E. Tro.	1	4 %	4 %	4 %	4 %	7/8 – 15/16	6/9	..	..	..	3 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1 – 1⅛	12/6	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	89 – 91	88 – 91	..	..	..	4 18 11
37,850	Telegraph Construction and Maintenance	12	15 %	15 %	17½ %	15 %	32 – 34	32 – 34	33½	32½	..	5 14 10
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	100 –102	100 –102	..	..	..	3 18 5
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	99 –100	99½–100⅛	100⅜	..	+ ⅛	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½ %	81 – 83	81 – 83	82⅛	..	..	5 9 9
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	28 – 30	27 – 29	..	..	–1	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	10 %	..	3/8 – 7/16	3/8 – 7/16	..	..	..	10 0 0
66,666	Do. 6 % C.P., 30,001 to 30,000 & 125,001 to 141,666	5	Nil	..	6 %	..	2⅜ – 2⅝	2⅜ – 2⅝	..	..	..	10 8 8
216,404	Do. 4 % 1st Mort. Deb. Stock	..	4 %	4 %	4 %	4 %	68 – 72	68 – 72	..	..	..	5 11 1

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	..	5½ %	5½ %	5½ %	..	4½ – 5	4½ – 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½ %	4½ %	4½ %	4½ %	95 – 98	95 – 98	..	..	..	4 11 10
30,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10 %	10 %	8⅞ – 8⅞	8⅞ – 8⅞	8 7/8	8⅞	– ⅛	5 15 11
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	8⅛ – 8⅜	8 – 8⅛	..	..	– ⅛	4 2 4
336,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 –102	99 – 102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	4⅛ – 4⅜	3⅞ – 4⅜	80/7½	..	– ⅛	5 14 3
80,000	Do. do. 4½ % Cum. Pref.	5	4½ %	4½ %	4½ %	4½ %	4⅛ – 4⅜	4⅛ – 4⅜	87/6	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Pri.	5	4½ %	4½ %	4½ %	4½ %	3⅝ – 4⅛	3⅝ – 4⅛	..	..	..	5 9 1
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 – 98	96 – 98	97⅜	..	..	4 1 8
49,486	Chelsea Electricity Supply, Ord.	5	6 %	4½ %	4½ %	4½ %	3⅜ – 4⅛	3⅜ – 4	72/6	..	..	5 5 11
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½ %	4½ %	4½ %	4½ %	102 –105	102 –105	..	..	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10⅛ – 11	10⅛ – 11	10⅞	..	..	5 9 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12⅛ – 13	12⅛ – 13	12⅜	..	..	4 12 4
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 –123	121 –123	..	..	..	4 1 4
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½ %	4½ %	4½ %	4½ %	100 –103	100 –103	101½	..	..	4 7 5
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2⅛ – 3	2⅛ – 3	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	..	3¼ – 3⅜	3¼ – 3⅜	..	..	..	6 13 4
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	98 – 98	96 – 98	..	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	8⅞ – 9⅛	8⅞ – 9⅛	8⅞	..	..	5 9 7
50,997	Do. do. 6 % Pref., 40,001—50,000	10	6 %	6 %	6 %	6 %	10⅞ – 11⅛	10⅞ – 11⅛	11 1/8	10⅛	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock	..	4½ %	4½ %	4½ %	4½ %	105 –108	105 –108	..	..	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	100 –103	100 –103	..	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	Nil	1/16 – 3/16	1/16 – 3/16	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	2 %	Nil	Nil	1/8 – 5/16	1/8 – 5/16	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½ %	4½ %	4½ %	4½ %	59 – 62	59 – 62	..	..	..	7 0 8
$3,150,000	Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds.	$500	..	..	..	5 %	83 – 85	83 – 85	81½	..	..	5 17 8
10,000	Folkestone, 1 to 10,000	5	5½ %	5½ %	5½ %	..	4½ – 5	4½ – 5	..	..	..	6 10 0
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	5 – 5⅛	5 – 5⅛	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	95 – 98	95 – 98	..	..	..	4 11 10
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½ %	8½ %	6⅞ – 7⅛	6⅞ – 7⅛	..	..	+ ⅛	5 17 3
$2,400,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	96½ – 98½	96½ – 98½	98	97⅛	..	5 0 0
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	8 %	7⅞ – 8	7⅞ – 7⅞xd	..	..	..	6 1 3
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 – 96	93 – 96	..	..	..	4 0 0
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½ %	3 %	1⅞ – 2⅛	1⅞ – 2	..	..	..	4 16 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	5 – 5⅛	5 – 5⅛	5⅛	..	..	5 11 8
374,386	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½ %	4½ %	4 %	92 – 96	92 – 96	..	..	..	4 3 4
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½ %	5 %	4⅜ – 5⅛	4⅜ – 5 xd	92/6	..	..	6 3 10
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½ %	4½ %	4½ %	4½ %	4⅜ – 5	4⅜ – 5	98/9	97/6	..	4 10 0
230,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½ %	4½ %	4½ %	4½ %	106 –109	106 –109	..	..	..	4 2 7
248,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½ %	3½ %	3½ %	3½ %	85 – 88	85 – 88	..	..	..	3 19 7
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	86 – 87	86 – 87	87⅛	86⅜	..	5 14 11
18,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	3½ %	78 – 80	76 – 78	78⅛	77	+1	4 9 9
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	109 –111	109 –111	..	..	..	6 6 2
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	89½ – 90⅛	89½ – 90½	90½	89½	– ½	5 10 10
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½ %	4½ %	4½ %	4½ %	96 – 98	95 – 98	96⅜	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	..	3⅞ – 4⅛	3⅞ – 4⅛	..	..	..	9 8 3
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	..	5 – 5⅛	5 – 5⅛	..	..	..	4 10 11
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	100 –102	100 –102	..	..	..	..
10,852	Notting Hill Electric Lighting	10	7½ %	7½ %	7½ %	7 %	11⅛ – 12½xd	10⅞ – 12½xd	..	..	..	6 5 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	5⅞ – 6⅛	5⅞ – 6⅛xd	..	..	..	5 9 10
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 – 97	94 – 97	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	2½ %	..	..	1⅝ – 1⅞	1⅝ – 1⅞	26/-	25/9	+ ⅛	..
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6	6	6	..	1 – 1⅛	1⅛ – 1⅜	22/6	21/6	+3/32	5 4 4
194,684	Do. do. 5% Deb. Stk. Red.	100	5	5	..	5 %	100 –103	100 –103	102⅛	101⅜	..	4 17 1
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	10 %	8⅛ – 8⅜	8⅛ – 8⅜	8 3/8	8 3/8	..	5 14 3
30,000	Do. do. 7 % Pref. 30,061 to 40,060	5	7 %	7 %	7 %	7 %	6⅞ – 7⅛	6⅞ – 7⅛	6⅞	..	..	4 16 7
150,000	Do. do. 3½ % Deb. Stock Red.	100	3 %	3½ %	3½ %	3½ %	86 – 90	86 – 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	..	5/16 – 7/16	5/16 – 7/16	..	..	..	Nil
46,700	Do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	68 – 70	68 – 70	..	..	..	5 11 1
65,000	South London Electricity Supply, Ord.	4	4 %	3 %	4 %	5 %	2⅛ – 2⅜	2⅛ – 2⅜	..	..	..	6 10 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½ %	2½ %	2½ %	2½ %	1/16 – 3/32	1/16 – 3/32xd	..	..	..	4 0 0
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅛ – 1⅛	1⅛ – 1⅛	..	..	..	5 12 0
220,000	Do. do. 4½ % 1st Deb. Stk.	100	4½ %	4½ %	4½ %	4½ %	101 –104	102 –105	..	..	+1	4 5 9
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	5/8 – 1	5/8 – 1	..	..	..	20 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1⅝ – 2	1⅝ – 2	..	..	..	12 10 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½ %	4½ %	4½ %	4½ %	77 – 81	78 – 82	78½	..	+1	5 9 9
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	..	1 – 1	1⅛ – 1⅛	17/9	17/3	– 1/16	..
110,000	Westminster Electric Supply, Ord.	5	12 %	12 %	10 %	10 %	8⅞ – 9	8⅞ – 9	8 7/8	8⅞	..	5 11 1
81,979	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½ %	4½ %	4½ %	5⅜ – 5½	5⅜ – 5½	5 3/8	5⅜	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank rate of Discount, 2 per cent. January 14th. 1909

REVIEWS.

Modern Theories of Physical Phenomena. By Augusto Righi. Bologna: Zanichelli. Price L. 5.

The second edition of this Italian work was published a few days only after the first, and the work has proved so popular that a third edition is now before us; this contains an entirely new chapter on what the author describes as the most interesting of all recent physical phenomena—"Radio-Activity." In this, as in the parts of the book previously written, the author has sought to employ the simplest forms of explanation, and it is due to this fact, and to the general clearness of the expressions used, that the book has become so popular. The book deals with innumerable experimental researches that have been carried out during the last few years with regard to electrical discharges, and the attempts made to complete the electromagnetic theory of light. Radio-activity may probably be called a magneto-optical phenomenon, the most interesting branch of science, the theories of which begin to fall into line harmoniously with existing theories of other branches, although, on the other hand, some of the accepted theories of recent years may also need modification as a result of the additional knowledge that radio-activity has placed in our hands, just as the old fluid theory of electricity has given way to the more modern theory which attributes electrical effects to atomic structure, notwithstanding that the prime cause of the effects is little better understood to-day than it was formerly. The book is worthy of most careful study, and much information is to be gained from it.

The Fixing of Rates and Fares. By H. Marriott. London: *Railway Gazette.* Price 2s. net.

This little work is an attempt to explain that intricate subject—the compilation of railway rates and fares. The matter contained therein is treated in a tolerably impartial manner, although we notice in certain portions of the work that the author's remarks appear to be rather indefinite; a fault which may possibly be owing to the responsible position he holds on the railway. From a railway company's standpoint, the work is admirable. If only to give the members of their large clerical staffs an insight into the railway rates business, it is certainly worth obtaining as a guide for the younger generation of railway clerks and prospective railway managers. To the public in general the book is not so valuable, as in our opinion it is not written from their standpoint. In addition to this, some of the particulars given are insufficient and inadequate to enable a trader to gain an accurate knowledge of the manner in which to compile, say, a rate book of his own from the material supplied by Mr. Marriott. We consider that for a reference work the book is useful—distinctly useful—but at the same time we think that more space should have been given to that section of the work which deals with "rates of traffic by goods train," because this topic is of primary importance to the trading public. Furthermore, information on this point is wanted by the traders.

The author divides the subject into eight sections, which we summarise:—(1) General; (2) Rates for traffic by goods train; (3) Rates for traffic by passenger train; (4) Ordinary fares; (5) Tourist fares; (6) Excursion and other cheap fares; (7) Season and traders' tickets; (8) Workmen's fares.

Section 2 is a very interesting and important subject to the trading population of this congested country.

The author states that the rates are divided into various classes:—A, B, C, and 1, 2, 3, 4 and 5; Class A being the lowest and Class 5 the highest.

The scale for the maximum rates and charges chargeable over the Lancashire and Yorkshire Railway is given, together with the scale of the maximum terminals, which include both the service and the station terminals. Altogether the book contains several scales, and the reader will possibly find them of some use to him, especially if used in conjunction with the other matter contained in the work.

Amongst the many features contained in the "Rates for traffic by goods train," in addition to those already given, we may mention the "Maximum rates and charges for animals and carriages," particulars of "Small parcels by merchandise train," "Classification of merchandise traffic," "Commodities entitled to low rates," and "Methods adopted in compiling class rates." We notice that several things have been omitted in this section; amongst others it may be mentioned that empties appear to have been left out; it must be remembered that empties come to a big thing in a year, and the scales might well have been included. There is not much doubt in our mind that many of Mr. Marriott's details have been worked out in a careful manner, especially with respect to the "Methods adopted in compiling class rates," and we have no reason to doubt Mr. Marriott's tables. We would repeat that we are of opinion that there is plenty to interest, and we have no doubt that Mr. Marriott will have many readers.

The other sections of the work are of more interest to the railway companies' officials, or to students going in for railway positions, than to the general carrying trade.

Zur der Theorie der Abschmelzsicherungen. By Georg J. Meyer, Dr.-Ing. Munich and Berlin: R. Oldenbourg. Price M. 3.

This small monograph of about 100 pages deals chiefly with the *theory* of fuses, but it also contains a series of practical results upon which the various constants required are based, and which, incidentally, afford interesting data as to the behaviour of the various metals employed as fuses.

The treatment is largely mathematical, and the subject has been dealt with throughout in a scientific spirit.

The first chapter is devoted to the discussion of the general theory of a simple fuse, for the time of fusion of which under given conditions a complex expression is developed. We note that the curve of temperature distribution along the fuse wire is taken as a parabola, whereas it should more correctly be considered as a catenary.

The equation for a long round wire heated up from the room temperature to the point of fusion is then considered at great length; the expressions obtained, however, are too cumbersome for practical use.

The section on the experimental work for the determination of the constants is interesting, and contains some valuable data.

Curves are given for the variation of specific resistance with temperature for aluminium, lead, zinc, tin, and an alloy of tin and lead, up to temperatures in the neighbourhood of the melting points.

A full series of curves for the metals employed as fuses in Germany is given, connecting the sectional areas of wires and strips with fusing currents and time. Of the metals given, silver and aluminium do not commend themselves to English ideas, the first on account of its cost, and the little advantage, if any, that it possesses over copper, and the latter on account of its unreliability, especially in small sizes.

Combinations of fuses in series and parallel are then discussed, and results are given of an interesting series of experiments with fuses of different materials in parallel, which should be useful in the design of shunted fuses.

The conclusions arrived at are given succinctly at the end of the book, and an appendix contains all the experimental results in tabular form.

As the record of a careful piece of scientific work the book can be recommended, but the practical application of the results appears difficult, on account of the large number of variables encountered in practice.—Alfred Schwartz.

The Elements of Electrical Engineering. By Tyson Sewell. Fourth edition. London: Crosby Lockwood and Son. Price 7s. 6d. net.

In the fourth edition of this excellent text-book, the author has added some new matter on "flame" arc lamps, and the improved forms of incandescent lamps. An appendix dealing with the three-wire system of distribution has also been added. As regards flame arc lamps, the only type

referred to is that known as the Excello, of which a good description is given. The Crompton-Blondel, the Jandus enclosed, and other flame arcs are not referred to. Following this are some illumination curves of D.C. and A.C. enclosed arcs, which the author thinks are self-explanatory. We are rather inclined to doubt this, because the student has been told nothing at all about illumination. Later in the book, it is true, photometry is treated of, but curves of illumination are not dealt with.

Mercury vapour lamps and the Moore tubes are lightly touched upon, but the English mercury vapour lamp, viz., the Bastian, is ignored. Can the explanation be that English makers are more reticent than foreigners, and afraid to have their wares described lest they should give away trade secrets? In the chapter on incandescent lamps a few pages on wiring are included; these should have come in Chapter III.

The author gives a diagram of the wiring of three floors of a building, and describes a method of arriving at the necessary section of conductor for each circuit. The method is a somewhat curious one. The pressure drop from the supply terminals to the farthest lamp is limited to 1·5 volts. The most distant lamp is naturally the one most remote from the third floor board, the distance being given as 40 yd. At a current density of 1,000 amperes per sq. in. we should, as the author shows, get a drop of about 1·9 volts, and as we only want 1·5 volt drop, the current density must be proportionately less, viz., 789 amperes per sq. in. So far, so good; but now the author tells us to keep the same current density throughout the installation, as then we shall not exceed the permissible drop.

The sizes are given, therefore, $\frac{100}{789}$ sq. in., $\frac{50}{789}$ sq. in., $\frac{20}{789}$ sq. in., and $\frac{6}{789}$ sq. in., the numerator in each case being the current in the respective circuits. Fancy telling a wireman to use a wire of $\frac{6}{789}$ sq. in.!

There is really no need to worry about the density at all, as it is obviously less than 1,000 amperes per sq. in. The required section can be obtained without it. Thus, to take the 50-ampere main, the size required is $50 \times \frac{1\cdot9}{1\cdot5} = 63$; this means a 63-ampere cable, or ·063 sq. in. Then why does the author recommend the same current density throughout? The farthest lamp from the supply terminals is only 20 yd. on the first floor, or half that on the third floor; obviously, therefore, the pressure drop would be half, and besides the unnecessary waste of copper, we should get an unequal pressure distribution over the installation, which is just what one should try to avoid. As we pointed out in reviewing an earlier edition of the book, the author is unusually accurate when dealing with the purely technical part of the subject, but gets beyond his depth when he leaves this to touch upon practical applications. Fortunately, he does not often venture out of his depth, so that on the whole the book is one we can recommend to the student.—F. B.

THE KOTYRA KEYBOARD PERFORATOR FOR WHEATSTONE AUTOMATIC WORKING.

Of all the telegraphic systems designed for handling large amounts of traffic on a single conductor, the Wheatstone still retains its pre-eminent position, notwithstanding the attempts which have been made in recent years to supplant it for fast speed work by means of type printing and other methods of telegraphy. The simplicity of the apparatus makes it so reliable and renders the cost of maintenance so low that there is little wonder inventors find it difficult to produce apparatus which can compete with a system that has stood the test of many years of heavy work.

The successful working of a Wheatstone circuit depends to a large extent on the employment of expert operators for preparing the slip by means of which the messages are signalled to line. The ordinary hand punching demands a considerable amount of physical exertion on the part of the telegraphists employed on this portion of the work, and after a few hours of continuous perforating the strain becomes so severe that the output per operator diminishes.

Keyboard perforators have from time to time been designed to enable the work of punching to be performed without the fatigue associated with the method of perforating each signal by hand. In such apparatus the aim has been made to perforate at a single blow the whole of the signals forming each character, but apparatus constructed on this principle must of necessity be complicated and expensive to maintain.

The Kotyra Perforator.

M. Kotyra, of Paris, the inventor of this keyboard machine, recognising the merits of the Wheatstone perforator which has stood the test of years of continuous working, designed his apparatus so as to utilise the existing Wheatstone perforator, thus avoiding the necessity for scrapping valuable apparatus when adopting keyboard working.

Briefly, the Kotyra mechanism is so arranged that a keyboard is made to actuate three electro-magnets, the armatures of which communicate the necessary number of blows to the keys of a Wheatstone perforator, in accordance with the character selected on the keyboard. In fact, the electro-magnets simply take the place of the operator, who, in the case of the ordinary hand perforator, has to make one stroke for each signal, whereas, with the Kotyra, the depression of one of the keys on the keyboard causes any required character to be perforated.

Description.

In our issue of August 16th, 1907, a short description was given of the Kotyra perforator as then constructed. Since that date the inventor has greatly improved his apparatus, which consists of two essential parts, namely, the electro-magnets and the keyboard. The former are mounted side by side on a framework of metal, which is designed to accommodate an ordinary Wheatstone perforator immediately underneath it. Three brass rods (with felt pads on their lower ends), one fixed to each armature, project below the coils forming the electro-magnets, and when at rest they abut on the space, dot and dash keys respectively

Fig. 1.

of the perforator. The depression of an armature gives a smart blow, which is communicated to the respective key of the perforator, and a space, dot or dash signal is punched. The keyboard has the well-known Universal arrangement of letters and figures, with any additional signs which may be required, so that anyone able to manipulate an ordinary typewriter can operate the Kotyra perforator.

A pinion driven by an electric motor is supported on the base, and runs at right angles to and beneath the whole of the keys. Each key has a lever connected to it, on the underside of which is a rack. When a key is depressed, the rack engages in the pinion and the lever disengaging itself at the end of its travel is, by means of a spiral spring, returned smartly to its position of rest. The key is then permitted to rise back to its normal position. A contact spring is fitted to each lever, and this spring passes over a series of metallic studs fitted in the base of the machine. These studs are electrically connected to one or other of the electro-magnets in such manner that a circuit is completed each time the spring comes into contact with a stud. Simul-

taneously, one of the perforating keys receives a smart blow, and this records a space, dot, or dash, as the case may be. Thus, in the case of the letter "Y," a single depression of the "Y" key on the keyboard causes five blows to be communicated in rapid succession to the perforator, and in the case of any of the numerals six blows are struck.

The electro-magnets are encased in a felt-lined wooden case, which effectively silences the noise of the perforator and enables the apparatus to be worked in close proximity to a sounder without causing inconvenience to the receiving operator, a result which is scarcely possible with an ordinary Wheatstone perforating set.

Fig. 1 shows the keyboard, the characters on which are arranged on the Universal plan, with the addition of figures, and any special signs used either in the British Post Office or by any of the Submarine Cable Companies can be added.

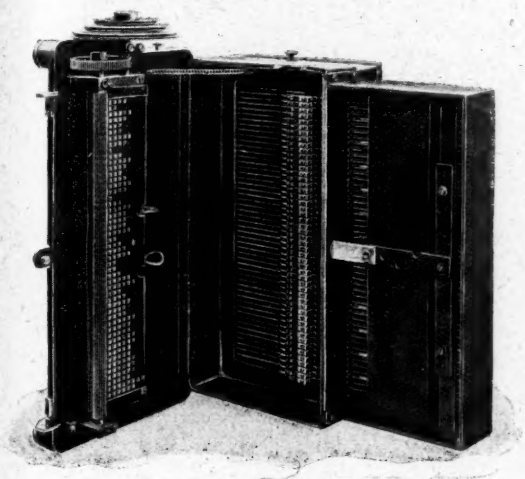


Fig. 2.

Fig. 2 shows the cover enclosing the keys raised up on its hinged back, exposing the lever racks on the upper side, and the contact studs on the base. (The apparatus has been up-ended for the convenience of the photographer.)

Fig. 3 shows the keyboard, immediately over which is suitably supported the case containing the electro-magnets. Three keys similar to the keys of a single needle are provided on the base of the electro-magnet case for electrically

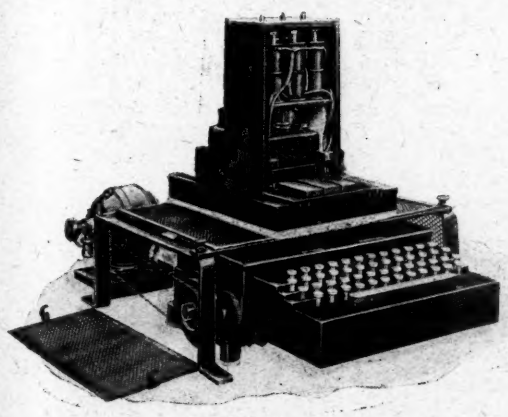


Fig. 3.

operating the perforator, when it is desired to use the apparatus without the keyboard. The protective gauze sides are removed in order to show the method of closing in the moving mechanism.

Fig. 4 shows the connections of the apparatus. The condensers are for the purpose of preventing sparking on the studs when a lever is in operation. The switch on the right is for cutting off the keyboard when it is desired to use the tappers, thus making the apparatus available for use by any telegraphist not acquainted with keyboard manipulation.

The coils of the electro-magnets, and also the motor, are suitable for use with any voltage between 80 and 120.

The motor is shunt wound, the speed of working being governed by the diameter of the pulley-wheel in use on the keyboard.

The total current taken by the apparatus is about 0·6 ampere, intermittently, and the "pull" of the specially con-

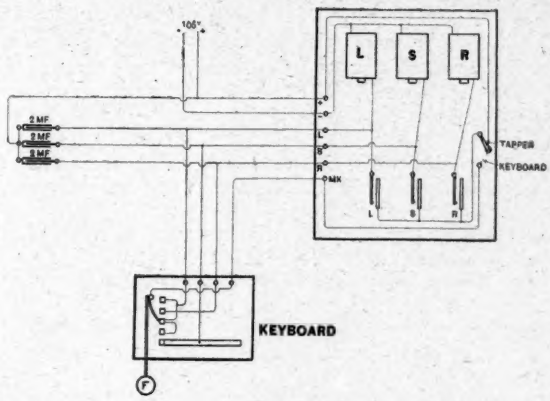


Fig. 4.

structed electro-magnets is so great that a four-slip Wheatstone perforator can be operated, thus making it possible to produce any number of slips from one to four simultaneously.

The apparatus can also be arranged to deal with a greater number of slips. The British Post Office has Kotyra machines fitted for punching eight slips, and has also one 12-slip machine.

The Kotyra apparatus is also used by some of the Submarine Cable Companies.

The Standardisation of Refractory Materials.—An important movement has been set on foot at Stoke-on-Trent, under the auspices of the English Ceramic Society, having for its object the arrangement of an agreement between technical institutes and societies representing various important industries for the grading and standardisation of refractory materials, such as fireclay and magnesite, used in the construction of furnaces, kilns, ovens, &c. The importance of any advance in the direction of making refractory materials more resisting to high temperatures has often been commented on; in Germany there exists a recognised centre to which one can refer for unbiased reports as to the qualities of refractory materials, but in Great Britain and in France, research of this character is in a very backward condition. Dr. J. W. Mellor, Staffordshire County Council Instructor in Pottery, and hon. secretary of the English Ceramic Society, has now taken the lead in initiating a movement to deal with the subject, and as the result of a circular sent out a meeting was recently held at Stoke-on-Trent, at which there were present representatives of various industries from all parts of the country. As the result of the deliberations of the conference it was decided to form a body, to be called "The Centre for the Standardisation of Refractory Materials," and the objects of the Committee were embodied in the following preliminary programme:—(*a*) To arrange and classify the various refractory materials—clay, siliceous, as silica and gannister; special, as magnesite, chomite, &c.; (*b*) to arrange standard specifications for the raw materials, and for the manufactured products; (*c*) to consider the possibility of arranging for uniformity in certain "stock" or "standard" sizes; and (*d*) to agree upon standard methods of testing, analysis, &c. To carry out this scheme it was agreed that the representatives of the institutes should consult with their respective fellow members, and wherever possible procure information bearing on their specific requirements, together with data as to furnace temperatures, and conditions of operation. Each section will at first conduct its own part of the inquiry independently of the others, and prepare a draft of their suggestions, to be submitted to the next meeting of the General Committee, which will be held in some centre other than in the Potteries, probably in London. These suggestions will be embodied in a provisional report to be sent back to the sections for approval or amendment, and finally published as a general report. It is proposed to revise this report periodically, to keep abreast of developments. Arrangements are being made with France, Germany and America, to ensure that the method ultimately arrived at shall be international. The negotiations with America are already in an advanced stage. Dr. Mellor has been inundated with correspondence by manufacturers since the initiation of the movement, which will probably lead to a very great advance in the quality of the finished products.

ELECTRICITY ON A RESERVOIR CONTRACT.

On the outskirts of North-east London, or to be more exact, in the valley of the River Lea between Chingford and Brimsdown, Messrs. Charles Wall, Ltd., are carrying out a large contract for the Metropolitan Water Board.

This work includes the diversion of the river over 3 miles of its course, and the construction of a reservoir 1½ miles long and ¾ mile wide along one side of the new river channel; the contract will in all probability require some four years to carry out.

There is nothing out of the common in such a contract, but in this case, special interest attaches to one feature—viz., the generation and distribution of electricity for use over the whole of the site, and the means adopted for this purpose. Electricity has, of course, frequently been employed for isolated work in such cases, but usually no attempt is made to supersede the majority of the inefficient portable steam plants associated with such work.

In this connection the Chingford installation is very instructive; it demonstrates what can be achieved by rough and ready transmissions, and by the electric motor out in the open—in fact, taking the place of the steam boiler and engine under the exceedingly arduous conditions which obtain in work of this description—and incidentally it reveals the advantages of suction-gas plant for such work.

In the carrying out of the work, the firm's engineer-in-charge, Mr. W. Benford, is luckily free from the restrictive rules and conditions attaching to permanent works under recognised supply authorities, and there is no doubt that this has contributed much to the effectiveness of the installation. The generating plant has been put down at a farm situated midway along one side of the area; the gas engines, consisting of two Crossley 125-B.H.P. sets and one 80-B.H.P. National engine, are installed in a barn, to which temporary additions have been made for the producers, &c. The engines are fixed to concrete beds, 6 ft. deep, resting on the clay; they are all provided with magneto ignition, and the larger engines are started on compressed air obtained from a double-cylinder compressor driven from a 5-H.P. motor in the ordinary way, but provided with a Gardner petrol engine for starting up when there is no gas.

Each engine has its own suction producer, with coke and sawdust scrubbers. The producer units can be worked independently or coupled by piping and valves provided in the gas mains; they are fired with Bradbury's anthracite from an overhead platform.

Despite its temporary character, no trouble has been experienced with this plant, and it appears to call for practically no attention when running except as regards the charging of the producers at four-hour intervals.

No trouble has apparently been experienced with the producers under the varying loads; indeed, we were informed that the fires had not been drawn for 12 months.

An elevated water storage tank supplies the jacket cooling water for the engines and the water seals of the producers, the water passed through an oxide of iron and wood-shaving filter with a view to removing any objectionable sulphur contents.

The electrical plant consists of belt-driven Crompton D.C. generators, two of 75-KW. each, of multipolar pattern, and one two-pole machine of about 40-KW. capacity.

These machines, which generate at 240 volts, are coupled to a substantial Crompton switchboard containing one feeder and three machine panels. The machine panels are fitted with circuit-breakers, and the feeder panel, which controls two primary outgoing circuits, with Dorman & Smith switch-fuses in both positive and negative. Sufficient instruments are provided to check the machine outputs and pressure of supply, and the steadiness of the latter, with individual machine loads suddenly varying from 300 to 100 amperes, is a testimony to the efficient governing of the engines.

As regards the two primary feeders, which run in opposite directions for 1½ miles on either side of the generating plant, these are carried overhead and consist of bare rectangular copper strip, 1 in. × $\frac{5}{16}$ in. section, carried loosely in porcelain cleats which are fixed on to 18 in. cross arms bolted to scaffold poles.

This primary transmission lies outside the area of the reservoir and river contract, and from it are branched off in any direction which may be required, secondary pole lines carrying 2/0 or 4 gauge circuits, to supply the various motors employed on the contract.

Generally it may be said that the secondary transmissions are shifted about according to requirements; the wires are carried loosely in bobbin insulators attached to cross arms as previously mentioned. Occasional poles are guyed, and the wires attached through globe strains; the secondary lines are all branched off through globe strains. The poles are planted some 3 ft. in the ground, and the method of carrying the wires in cleats, &c., allows of considerable pole movement without interfering with transmission.

In all, some six or seven miles of pole line are in use, supplying some 40 motors required for driving centrifugal pumps, pug mills, an electric transporter, an electric grab, workshops, &c., together with arc and incandescent lighting in the shops and offices.

The area covered by the contract is a fairly level stretch of valley, which will be covered by the reservoir when complete, and will have the new river channel on the Chingford side. In forming the reservoir, the first operation has been to construct a puddle trench, which goes down possibly 20 ft. below the present ground level, on to the London clay, passing through layers of clay and water-bearing gravel.

The puddle trench marks the site of the future reservoir embankments, the central layer of which will consist of an impervious bank of clay puddle rising to the full height of the embankment.

Bearing these details in mind, the peculiar adaptability of electrically-driven plant will be readily seen. First, of course, comes the excavation of the puddle trench, which, after the removal of the subsoil, is carried out by means of a travelling electric grab, with a gantry of about 25-ft. span, running on rails placed on either side of the trench. The electrical equipment, consisting of 15-H.P. hoisting, 6-H.P. travelling and 4-H.P. traversing motors is carried, as regards the first and last, on the under framing of an operator's cabin, the travelling motor being attached to the gantry outside. The motors are all fitted with magnetic brakes and controlled through liquid starters, and the "grab" is one of the Priestman latest pattern, weighing 35 cwt.

On the same track as the grab is a similar gantry crane, of smaller build, equipped with a skip, and provided with 10-H.P. hoisting, ¾-H.P. traversing and 4-H.P. travelling motors. In the case of both cranes, power is obtained from a secondary feeder line running parallel with the trench.

Several pug mills are in use, operated by motors of from 40 to 15 H.P.

For hauling the pug mills and the material in the vicinity, motor-driven winches are being provided, certain transformed steam winches serving for this purpose; the pug mills are geared direct to the motors, and despite the extreme conditions attaching to this work, such as rapidly varying loads, damp and muddy situation, rough and ready erection and a minimum of attention, scarcely any trouble is experienced with the motors.

Pumping, of course, plays a very important part in this class of work, and a large number of motor-driven centrifugal pumps are in use continually. Continuous operation is in many cases a necessity, as otherwise the excavations would be flooded in an hour or two.

The whole of the repairs to motors, controllers, arc lamps, &c., are carried out by the staff, and sufficient spare parts and machines are kept ready for emergencies.

The plant was erected, and is run, under the direct supervision of Mr. Benford, the firm's engineer.

Mirrlees Watson Co., Ltd.—A dividend of 5 per cent. (1s. per share), free of income-tax, is recommended for the year. £1,250 is applied to new tools account, and £1,251 is carried forward.

Italy.—La Societe Elettricita Alta Italia, of Turin, is declaring a dividend of 5 per cent. for the last financial year, the same as for the preceding 12 months.

THE COMPLETION OF A CONTRACT.

[BY OUR LEGAL CONTRIBUTOR.]

There is one difficulty which besets the interpreter of every contract which involves the expenditure of work and labour. How is he to define the moment when the contract is complete? The writer has recently had submitted to him a number of problems involving this and other questions which may be usefully dealt with in these pages. But before dealing with them it may be well to make some preliminary observations which will serve to explain the replies given.

When can a contract for the erection of machinery be said to be completed? This is a question of considerable practical importance, which can only be answered after a very close scrutiny of the terms of the contract and specification with which the contractor has had to comply. To merely erect an engine or other piece of machinery is one thing; to put it into, and leave it in, such working order that it will do the guaranteed work or supply the necessary power, is another and a very different matter.

When construing the terms of a contract, one must not lose sight of what was in the contemplation of the parties. Instance the case of an electric supply authority requiring a complete installation which shall be capable of supplying a certain specified number of kilowatts. The supply authority will in most cases require that *(a)* the work shall be completed by a certain time; *(b)* it shall pass certain tests; *(c)* that the contractor shall maintain it in good working order for a stated period. All these things may well be provided for in the written contract. But there never was a contract yet which provided for all contingencies. However skilful the lawyer, it is impossible for him to foresee every question which may arise between the parties. Nor can he, within the limits of a reasonable document, define the technical terms which he uses.

There is one fundamental principle of law which must never be overlooked in considering the question whether a contract has been completed. It is that, where there is a contract to do work for a lump sum, until the work is completed, the price of it cannot be recovered. The only exceptions to this rule arise when it can be shown that it was the fault of the employer that the work was incomplete, or that there is something to justify the conclusion that the parties have entered into a fresh contract.

Example.—A contractor built houses under a special contract, but omitted to put into the building certain joists and other materials of the given description and measure. He brought an action against the building owner to recover the balance of the contract price, the chief part having been paid. It was held that the plaintiff, not having performed his agreement, could not recover either on the contract, deducting the difference in value, or upon a *quantum meruit* (Ellis *v.* Hamlen, 1810, 3 Taunt, 52).

The law as above stated is old, but is none the less good and applicable at the present day. Take the case of a contractor who undertakes to put in plant—say, an engine which, when burning a stated quantity of a certain kind of coal, will pump 3,000 gallons of water per minute. He agrees to provide this machinery for a fixed sum. Unless he complies to the letter, he can recover no part of the price. Thus, suppose he has undertaken that the machine will do the work in question with slack coal or smudge, and it fails to do this, he cannot say to the employer, "If you use Warwickshire coal, the machine will attain the desired result." Again, suppose that the pump will discharge 2,500 gallons of water per minute instead of 3,000, the contractor cannot say, "I am entitled to five-sixths of the purchase price, as I have complied with my contract to that extent."

The law is that performance of a contract to complete a whole work, and not merely all the parts of that work, includes everything necessary to complete the whole. If the contractor does not complete, he renders himself liable to consequential damages for not completing, and it does not matter that the indispensably necessary works are not specified, or are not shown on the drawings, or are calculated wrongly, or are understated, or that their cost is under-estimated in the engineer's specification, or that the works are impracticable. The following is an example of an entire contract. A tradesman undertook to make for a lump sum certain water tanks with certain stays, "capable of sustaining a head pressure of 60 ft. of water." Finding that as constructed, they would not sustain that pressure, he strengthened them by adding stays, which he charged for as extra furnishings. It was held that the employer was not liable beyond the amount mentioned in the contract (Wilson *v.* Wallace, 1859, 21 Ct. of Sess. Cas. (2nd series) 507). Again, in Hydraulic Co. *v.* Spencer, 1886, 2 T.L.R. 554, the defendant contracted to cast cylinders according to specification and plans, the cylinders to stand a pressure of 25 cwt. to the sq. in. It turned out that if the cylinders were cast according to the specification, there would be an unavoidable defect. It was held that Spencer had contracted to supply sound cylinders, and that, as he had not done so, although he had adhered to his plans, he was liable in damages.

It is also worth while to note that if a contractor does work superior to that which is specified for, he cannot recover the additional cost of it.

What has been laid down in cases relating to contracts to complete a building, applies with equal force to contracts which involve a guaranty that a machine will work. Thus in one case the plaintiff made a cutting machine for the defendant under a special contract, with a stipulation that if the machine did not work the plaintiff was to be paid nothing. The machine failed to work. It was held that though the materials might be of some value, the plaintiff not having performed his special contract, nor proved a substituted bargain, could recover nothing (Grounsell *v.* Lamb, 1836, 1 M. & W. 352).

The principle already enunciated, namely, that a contractor cannot recover part of the price for work which is only partly performed, applies with added force to cases where the work has been done on the land of the employer. In the case of a mere chattel, such as an engine or a generator, it may be possible for the purchaser to return it if it does not suit his purpose. But where there is a contract for the erection of an entire installation on a man's land, and the contractor does three-quarters of the work and fails to complete, the employer cannot be compelled to pull down and return that which is partially erected. A man cannot help accepting that which is built upon his land.

Nor does the fact that the employer uses things partly erected in attempted fulfilment of the contract necessarily mean that he has waived all claim for defects.

Having now considered a few leading principles of the law of construction contracts, let me turn to the questions which have been suggested. The first is:—

1. *When is a generating plant "complete" under a contract made under the Institution of Electrical Engineers' model contract conditions?*

Turning to the conditions, one finds that the Institution have carefully refrained from defining the word completion in their form of contract. In this they have been well advised. It is essentially a matter for the engineer appointed under the contract to say whether the contractor has carried out his obligation or not.

It would seem, however, that the word "completion" as used in that form of contract, does not mean "completion" in the sense that all the guarantees have been fulfilled. Thus, by Clause 41: "On the completion of the works on the site, the contractor, after giving the engineer 14 days' notice of his readiness to make the 'tests on completion,' shall test the operation thereof . . . ." and "as soon as the tests have proved that the plant has completely fulfilled the contract conditions, the engineer shall forthwith so certify in writing to both the purchasers and the contractor, *and thereupon it shall be* deemed that the purchasers have taken over the plant." If the plant fails to pass the tests, the courses open to the purchasers are indicated by Clause 44.

The next question is:

2. *Suppose a plant is contracted to be delivered to give* 1,000 *kw., and it is put into beneficial use, but only gives as a maximum* 900 *kw., and while doing so in the first week breaks down, at what stage is it "complete?"*

The answer to this is that a contract for a machine to produce 1,000 KW. is never complete until it does produce this

amount of power. The purchaser is entitled to reject it, and on giving notice of rejection he may recover the price paid. Further, as we have seen, if it has become annexed to the freehold, he may not even be obliged to reject it or send it back.

3. *Liquidated damages accrue from the date of completion agreed under the contract until actual completion. In the case above, from what date to what date do they accrue?*

Liquidated damages will accrue as from the date by which the contractor undertook to erect a machine capable of producing the required number of kilowatts. It will be found, however, that in most contracts there is a clause which gives the engineer power to extend the time for completion, or otherwise to make allowances for delay.

4. *According to some contractors' views, completion is to be held to mean the placing on the site of all structural parts, and assembling them irrespective of the results obtained. Further, it is sometimes asserted that if once beneficial use, but only partial use, be made of plant for a day, liquidated damages cease, and the period of maintenance commences. Are either of these views correct?*

These are questions which must entirely depend upon the terms of the contract between the parties. Let us assume, for the sake of argument, that the terms are those of the Institution of Electrical Engineers. It is there specifically provided (by Clause 42) that the purchasers may, pending any arbitration under the contract, use any portion of the works reasonably capable of being used, and paying therefor at an agreed rate. In the absence of such a clause, it is apprehended that the employer or purchaser who uses a machine in such a way as to get as much work as he can out of it, might be deemed to have accepted it *pro tanto*, and to have rendered himself bound to pay for it.

5. *Suppose a plant is completed and tested, but breaks down immediately upon being put into commission and recurrent breakdowns take place preventing the use of the plant by the purchaser and rendering the plant incapable for months of earning revenue, what remedies has the purchaser against the contractor?*

If the plant prove utterly useless for the guaranteed purpose it may be scrapped, and the purchaser will be at liberty to recover the entire amount which he has paid together with consequential damages.

The Illuminating Engineering Society. — With reference to the criticism offered by "United" in our "Correspondence" columns last week, it is pointed out to us that the full particulars of the formation and objects, &c., of the Illuminating Engineering Society are given in the March issue of the *Illuminating Engineer*, which contains a detailed report of what transpired at the inaugural dinner given by Mr. Leon Gaster, the editor of that journal. We had not observed this report when the letter appearing in our last issue went to press, but any of our readers who may be sufficiently interested in the matter will there find a summary of all the speeches made—speeches which will suffice to explain the main lines on which it is proposed to run the society and to some extent its *personnel*. The journal referred to has been appointed the society's official organ, with the object of saving expense. We published a brief record of the dinner in our issue of February 19th by courtesy of Mr. Gaster. The editor is also publishing in his journal his recent Cantor Lectures (Society of Arts) on "Modern Methods of Illumination."

Hardening Tools.—In the United States the use of lead for heating steel in the tool hardening shop is giving way in some instances to another substance—chloride of barium, a salt which is stated by the *American Machinist* to be sold at about 1½d. per lb., and will last well, not being thrown away until considerably fouled by steel scale. Lead, in a melted condition, throws off more or less fumes which are dangerously poisonous and cumulative as are all the lead poisons, and even with a draught hood certain safety is not to be secured, probably because lead may give rise to heavy vapours which may not be entirely amenable to a hood draught. The crucible for barium chloride is of graphite, and is heated in a gas furnace. The proper temperature is that at which a piece of steel with a ground or machined surface will not show blisters after heating up to the bath temperature, cooling and brushing off. This temperature should be noted by pyrometer, and the bath kept at a few degrees less. It is claimed for the barium bath that there is but little danger of injuring delicate or sharp corners of a tool, and that it is easy and safe to work. Tools are quenched in the usual way and let down in oil. We believe horse tallow is much used for the letting-down bath.

PROCEEDINGS OF INSTITUTIONS.

The Kapp-Hopkinson Test on a Single Direct-current Machine.

By Dr. W. Lulofs.

(*For abstract of Paper, see* Electrical Review, *March 5th.*)

Discussion.

Dr. W. E. Sumpner said that the method described looked complicated, but he had no doubt it was a good method and could be made a very valuable test for multipolar machines.

Mr. S. H. Holden did not think that the proposal to arrange that the pull caused should be upward quite overcame the difficulty, because in that case the bearing friction would be less than under actual working conditions.

Dr. G. Kapp said they had always understood that it was dangerous to work machines without Mordey equalising connections on account of the heavy circulating currents that would otherwise occur. If the author was right in his conclusions, and he seemed to be right, they had been wrong all along in fearing these circulating currents.

Mr. A. E. Gott did not see how the test could be applied to machines having an odd number of pole-pairs, and pointed out that the weakened poles were all on one side of the armature, which was bound to produce stresses for which the machine was not designed.

Dr. J. D. Coales said that he had been able to see many of the author's tests; the currents in the two halves of the armature did not differ greatly in value, even when they carried the strengthening of one pole and the weakening of the other much further than in the case quoted.

Mr. G. A. Wigley (Birmingham), in a written communication, said that the method did not admit of such universal commercial application as would at first sight appear. Manufacturers generally employed wave-windings for small machines whenever possible, and equalising rings were nearly always fitted to parallel or lap-wound armatures, especially now that the general use of special commutating poles had raised the sparking limit.

Dr. Lulofs, in his reply, said that he did not deny that the method was complicated, but he thought it compared favourably with other complicated tests. He felt quite sure that designers could make a four-pole lap-wound machine without the slightest difficulty due to circulating currents; the reason so many lap-wound machines had circulating currents was that the fields were very highly saturated.

The Electro-Hydraulic Pumping Plant at the Bristol Docks.

By W. A. Clatworthy, M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers *at Newcastle, February 1st*, 1909.)

The plant about to be described is intended to provide water-power for operating various cranes, capstans, lock-gates, bridges, &c., in connection with the Bristol Docks. Until quite recently this work has been done by two sets of heavy steam reciprocating pumps.

The new pumps, which were made by Messrs. Fullerton, Hodgart and Barclay, Paisley, are of the duplex differential ram type, delivering 150 gallons of water per minute against an accumulator pressure of 750 lb. per square inch when running at 60 R.P.M.

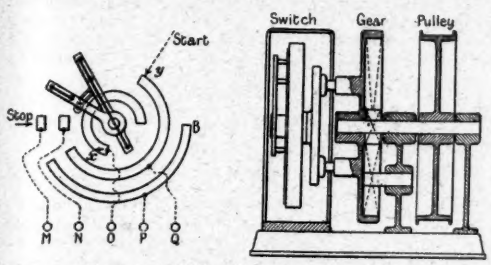
The motors are by Messrs. J. H. Holmes & Co., of Newcastle-on-Tyne, six-pole, open type, with three bearings, designed for a normal speed of 240 R.P.M., 500 volts, but arranged to run up to a maximum speed of 360 revolutions by means of field regulation. The motors are shunt wound and capable of easily giving 125 B.H.P. normally and 150 B.H.P. as an overload. The efficiency is 91 per cent., giving a fairly straight "curve" over a good range of load.

A single reduction of machine-cut double helical gear is used between each motor and set of pumps, with a ratio of 1 : 6—*i.e.*, 12-in. pinion and 72-in. wheel; the teeth are staggered. The wheels run in an entirely enclosed cast-iron casing forming an oil-bath.

The whole of the switching apparatus was made by J. H. Holmes and Co., consisting of a switchboard in the pump house, and of three relay switches in the accumulator house.

The starting switch is of the long-screw type with 50 to 60 contacts, each contact consisting of a permanent gun-metal base bolted to the marble slab, with a renewable copper bar screwed upon it. The sliding contacts, four abreast, any one of which can be instantly removed, are carried from a travelling bridge worked up and down by the screw, which runs in ball-bearings, and is rotated by a small reversible Lundell motor through triple-threaded wormgear, a regulating switch being provided for adjusting the speed of starting the pumps. The usual time occupied is 15 to 16 seconds, but the return of the starter is quicker. The screw starter contains a lever switch closed mechanically by means of a tappet operated from the travelling bridge, and held on magnetically, thus providing a no-voltage release. A relay circuit is made by this lever in its "off" position, so that the starter is automatically returned to its initial position on the resumption of the current supply. The pilot motor circuit is taken from the neutral wire to the negative main, 250 volts. This pilot circuit is kept quite distinct from the

main circuit, and has its own double-pole fuses, and no-volt release double-pole switches. The field regulating switches for the pump motors are of the solenoid type, with oil dashpots for retarding the motion both in raising and lowering the speed. There is no permanent step for speed regulation between 240 and 360 revolutions. The point where this increase of speed shall take place is determined by the movement of the accumulator, but the screw starter is provided with special contacts in its full "on" position which prevent the field regulating switch from rising until all the



M, N, To no-volt release bobbin on starter; o, To + supply; P, To shunt regulating switch solenoid; Q, To pilot motor solenoid.

Fig. 1.—Hydraulic Accumulator Switch.

starting resistance has been cut out, thus ensuring that the motors shall start with full field strength, no matter how rapidly the accumulator may be falling.

The pilot motor which operates the starter is controlled in both directions of rotation by small solenoid switches without the use of starting resistances, the connections thus being very rapid.

Owing to the limited capacity of the transforming station from which the energy supply was drawn, it was necessary to provide that not more than one set of pumps should start at a time.

As a general rule two sets of pumps deal with the load satisfactorily, but all three sets are kept in working order, and do their share of the load in turns. A three-point six-way grouping switch is mounted on the switchboard so that four combinations are possible.

In the accumulator house are three rotary switches controlling the relay circuits of the pilot motors on the starting switches, rotated by wire ropes from the accumulator. Each accumulator switch is mounted on a marble base and fitted in a cast-iron box; the switch spindle is positively driven from the pulley and gear through pottery insulators on pins forming a kind of flexible coupling highly insulated (fig. 1). The switch has two levers which are adjustable relatively to one another in an angular direction for varying the period between starting and stopping. The total angular movement of the switch corresponds exactly with the total travel of the accumulator.

In order to reduce the frequency of starting and stopping as much as possible when two sets of pumps were at work, it was necessary to adjust the switch-levers so that the second set of pumps not only started after but also stopped before the first set working in conjunction with it. The diagram (fig. 2) shows the

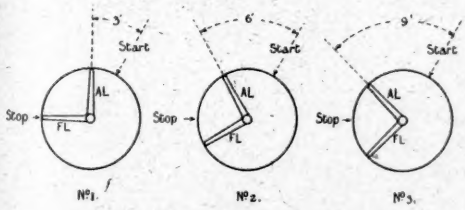


Fig. 2.—Positions of Levers.

positions of the levers as set on the three switches. FL represents the lever which is fixed to the switch spindle, and AL represents the second lever, which is adjustable relatively to the first.

When No. 1 and No. 2 pump sets are switched into circuit, No. 1 will start up after the accumulator has fallen, say, 3 ft. If, now, the demand for power is less than the supply, the accumulator will rise, and the pumps will be stopped when the accumulator is within about 1 ft. from the top of its travel. If, however, the demand exceeds the supply, the accumulator will fall a further 3 ft., when No. 2 pumps will start. If the accumulator still descends with No. 1 and No. 2 at work, then No. 1 will go on top speed first, the lever of the rotary switch having reached the point B, fig. 1, where current passes, exciting the solenoid of the field regulating switch. A further descent of 3 ft. brings No. 2 set on to top speed also in a similar manner.

No. 3 also starts when 9 ft. from the top, and stops within 6 ft. from the top.

It will be seen from the diagram, fig. 1, that when rings *x* and *y* on the accumulator switch are connected, current excites the solenoid of the pilot motor switch for starting the pumps; it may happen at such a moment, however, that the demand for power suddenly ceases, and the first few strokes of the pump cause the accumulator to rise and consequently the lever to fall away again from contacts *x* and *y*, so, in order to prevent the solenoid switch breaking circuit and thus causing the starter to remain in an intermediate position between "off" and "on," special contacts are provided by which the circuit to this solenoid, when once made by the accumulator switch, is maintained until the starter has reached the limit of its travel.

The relay automatic system may be put out of action altogether, and the pumps run continuously, the water being by-passed in the ordinary way at the top limit of accumulator travel.

It is quite common for a set of pumps to start and stop as often as 20 to 24 times in an hour; again, a set has been known to run for four or five hours without stopping. The work is very variable, and depends on the demand for power for several swing-bridges, lock-gates, cranes, &c.

Under tests conducted by the Bristol Docks officials, an efficiency of 82 per cent. was obtained, reckoned upon the displacement of the rams against the amount of energy used by the motors.

Concerning Method in Invention.

By C. Turnbull, M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers *at Newcastle, January 18th*, 1909.)

The author pointed out that method might be used with advantage in the actual practice of invention, and set out rules which he had tried and found useful. These rules, which he called "operators,' are briefly outlined below.

Selection and Chain Operator.—The selection operator works by setting forth clearly the parts on which the inventive faculty may work, like so many links in a chain, each link in turn being examined to see what can be done with it. Taking, for instance, the leading-in wires of an incandescent lamp, one may operate on the material and the shape of the wire, the constitution of the glass, and the use of material or cement round the wires. The shape of the wire was neglected until Bastian tried flattening the wires, and found that an air-tight joint could be made with flat copper wires. This would have been done long ago if the possible parts and methods of working had been written down methodically.

Equivalence Operator.—Once a method has been proposed, equivalent methods can be found which will work better. Thus the carbon filament of the electric lamp was originally made from a carbonised thread or vegetable fibre; a great improvement was made when an equivalent thread was formed by squirting. Again, one maker makes steam turbine blades as strong as possible at the ends, so that they will not be damaged by touching the casing, while another thins the tips of the blades so that no damage will be done if they do touch.

Change of Position and Addition Operators.—Much invention may be done simply by changing the position of parts or of operating forces. Thus, in the steam turbine, the flow may be axial, radial, or tangential; the turbine may be vertical or horizontal; the low-pressure end may be separated from the high-pressure end, completely or incompletely. Starting from this point, almost every possible design of turbine can be deduced from two or three primitive forms by combining together and changing the number of the expansions.

Omission and Direct Operator.—Pringle's trolley-wire suspension may be derived from the previously known catenary suspension by omitting the centre part of the catenary. The enclosed arc lamp was greatly improved when the inner globe was omitted.

Change of Proportion and Increased Function Operator.—Much invention consists merely in changes of proportion; thus the electric motor is simply a changed galvanometer, while the steam turbine is merely an altered windmill. It was known that the electrical resistance of certain materials decreased with heat, *e.g.*, the carbon-filament lamp; Dr. Nernst carried this to its logical conclusion by using for an electric lamp burner a material which was an insulator when cold.

Separation and Combination Operators.—Much invention consists in the mere combination or separation of parts. Thus, in electrical meters, the braking and motor magnetic circuit are combined in the latest Hookham, whereas previously two magnets were used for these purposes in the Ferranti type. The automatic telegraph provides a well-known case of separation. Sufficient speed could not be got by direct operation; hence the use of a punched tape, which separates the operator from the machine. The punched tape has since been used for many other purposes. Again, by combination one part of a machine can be made to carry out other functions in addition to its own, as the connecting rod operates the valve in Joy's valve motion. The Ferranti-Hopkinson steam valve is an instance of the combination of a special nozzle and a valve, giving excellent results; the gas engine shows the result of combining an explosion chamber, a pump, and a cylinder in one.

Transference and Distribution Operators.—Transference is a very powerful operator, and much invention is done through it. Thus the gyroscope was used years ago to steady torpedoes; now it is used to steady ships at sea, mono-rail cars, &c. The varying cut-off governing of steam engines was transferred to the turbine by admitting the steam in gusts; this method was again transferred to the regulation of dynamo fields in the case of the Tirrill regulator. Compressible tins for paint, &c, the use of a beam of light for magnifying purposes, and so on, are other examples of transference.

The Converse or Reverse Operator.—It frequently happens that we can deduce a converse action from an invention. Thus the piston engine becomes a pump—and so does the turbine; the heat engine also becomes a refrigerator, and the dynamo a motor.

The Constraint and Freedom Operator.—The greater part of mechanics has for its object the constraining of parts to cause them

to carry out their functions in an unvarying manner. Occasionally machines become too constrained, and have to be set free by the Freedom Operator. For example, very high speed turbines require flexible shafts or partially free bearings to enable them to run at all. Flexible roller-bearings will work where hard and rigid types are unsuitable.

The Relay Operator.—In many cases mechanism cannot be directly operated, and relays are employed. Wireless telegraphy is an illustration of this.

Many other examples of inventions were employed by the author to give point to his remarks under the various headings.

Discussion.

Mr. C. Faraday Proctor said he had used the system of operators in the course of his own work, and had found it exceedingly useful. In invention it was highly important to consider every possible way of doing a thing, and this was of the highest importance when drawing up the specification. The great similarity among many inventions was simply due to the later inventors working round the original invention, and if the original inventor had done the same thing all others would have been blocked. For example, in the case of Bastian's flat-strip leading-in wire, a streak of metallic paint was obviously, in effect, a flat strip of metal, but Bastian's patent did not cover this; the result was that the man who looked for another way round had a valid patent. Lamps with these painted leading-in wires were shown at the Franco-British Exhibition. It was sometimes difficult to know when one had a good thing, a good instance being the case of the ordinary fish-plate. It seemed an obvious thing to join two rails by means of a flat strip of metal; but, nevertheless, the fish-plate was patented, and proved a remunerative idea for a number of years. In the development of every invention a critical point was reached, beyond which the final value of the idea fell off, and below which the idea was not as useful as it might have been. In designing the "S" lampholder (one of his own inventions), he started out with the idea of getting as great a distance as possible between the contacts, with the result that, although not working towards that end, the holder had an extremely high insulation resistance. The idea of holding the crank of an engine fast and allowing the cylinder to revolve, was apparently a useless suggestion, but he believed that it had been put into practice in the case of flying-machine engines, in which extreme lightness was essential, thus saving the weight of a fly-wheel. Inventors must have faith in their own ideas, and this was the foundation of many of the most useful inventions on the market.

Mr. Tremain thought that similar methods were put into practice by the early inventors, but they had not the facilities of those of the present day, and this undoubtedly accounted for the late appearance of many inventions. He suggested that Mr. Turnbull should apply his methods to the design of a telephone repeater.

Mr. H. W. Clothier said that the paper omitted altogether the question of necessity, and while an inventor might not give a thought to this, the manufacturer was forced to do so, because he had to find a market for the stuff after he had made it. Many an inventor felt injured because a manufacturer did not jump at the offer of an invention, but it must be remembered that every manufacturer had scores of such offers, and that, consequently he had to cultivate hardness of heart as a protection. Again, many inventions, excellent in themselves, came too late, and he mentioned the case of his own firm, which had the offer of a good design for slow-motion motor-starters, but, in making this offer, the inventor entirely overlooked the fact that the firm already had a starter on the market which allowed a gradually increasing current to pass, and that without any mechanical accessories whatever. There was nothing new in the idea of explosion fuses. The first fuses were simply lengths of wire in the open. Then, in order to save the appearance of the slate or the attendant's complexion, they were put into a tube, which, of course, much increased the explosive effect when the fuse blew. Then somebody suggested closing one end so as to increase the blow-out action, and now someone comes along with a suggestion to increase this still further by making the fuse ignite an explosive. The Merz-Price system was not simply a combination of the circuit-breakers at each end of a feeder; it was a brilliant example of meeting an entirely new set of conditions by means of an entirely new combination of current transformers, relays, &c., and many of the details used in connection with the system were really inventions in themselves.

Mr. Ralph agreed that according to the paper it was only necessary to write down every possible way of doing a thing, in order to produce an invention, but the author had overlooked the necessity of stopping at the critical point or of knowing when it had been reached. Undoubtedly, every inventor used these methods; otherwise, except in a few isolated cases, invention would be impossible.

Mr. J. P. Sleigh considered that all the previous speakers had entirely missed the point of the paper. While he agreed that possibly every inventor thought out all the possible ways of doing a thing, he claimed that Mr. Turnbull had reduced the process to a system, and the paper was valuable on that account.

Mr. A. L. E. Drummond considered that the paper attempted too much. It was not fair to try to block everyone else out, and he felt sure that the granting of too wide patents retarded development. Twenty-five years ago it was impossible to invent a new telephone transmitter; every possible and impossible way had been patented, and this, undoubtedly, was responsible, to a great extent, for the backward state of this country in telephony.

Mr. Tremain, in a further contribution to the discussion, mentioned some experiences with the Hughes telegraph, to show that altered conditions might render any invention useless. In the case in point, at first he had to design a motor which would have as perfect regulation as possible, but on another line, *i.e.*, under different conditions, the motor had to regulate as badly as possible.

Mr. Turnbull, in his reply, mentioned that he had thought of this system for the past 15 years, and had found the methods he advocated to be of great practical use. While it seemed an obvious thing that inventors should think of every possible way of doing a thing, experience showed that they did not do so. He gave instances which showed that the early inventors were not methodical, and also pointed out that the urgent necessity for many things had been present for years, before they were invented. He suggested that large firms should employ staffs of experts to do nothing else but draw up systematic lists of ways of doing any particular thing, and on these lines they would eventually have large masses of material from which they could draw at any time.

Roentgen Society.

At the last meeting of this society on March 4th, Mr. A. A. C. Swinton, M.Inst.C.E., occupied the evening with some experiments upon vacuum tubes and high temperature effects with the cathode rays. One of the most interesting experiments was the entire conversion of a diamond into coke by means of an electric discharge. The cathode ray furnace for the purpose consisted of a glass tube with two concave cathodes focusing upon the diamond. The diamond was placed upon an iridium plate, which in its turn was supprted in a platinum cup. Alternating current was applied to the terminals, and the temperature, measured by an optical pyrometer at the time of the diamond's conversion, was 1,890° C. Mr. Swinton said that one of the points that could be investigated by thus transforming the diamond, was whether or not the diamond consisted, as Sir William Crookes once maintained, of carbon dissolved in one of the rare gases, such as krypton, argon, or neon. Before and after the conversion of the diamond in the tube, Mr. Swinton sealed off samples of the residual gas, and the two spectra, the one taken before and the other after conversion, were practically identical. This seemed to prove, he thought, the absence of these rare gases, as there was not a line in one spectrum that did not exist in the other.

A portion of Mr. Swinton's paper was concerned with experiments upon the question of the occlusion of gas by the walls of vacuum tubes. In a paper read before the Röntgen Society eighteen months ago, he said that he found that when the walls of old tubes were strongly heated, numerous bubbles were found in them at the rather extraordinary depth of ·1 mm. from the inner surface of the glass. He now found, however, that if about ·01 mm. was ground off from the inner surface of the glass before heating, no gas bubbles made their appearance. The inference was, of course, that originally the bubbles only penetrated the glass to about ·01 mm., but when heated in the flame the glass became soft and they penetrated to the further distance. This distance, ·01 mm., was quite a reasonable one for the cathode rays to penetrate into the glass.

Mr. Swinton also stated that he had been carrying out some experiments with regard to the blackening and consequent hardening of X-ray tubes. He made several cylindrical tubes, each pair having a kind of Siamese connection to a single stem, and made quite sure that there was the same amount of vacuum in each of them. One of the tubes he allowed to become very black, while the other remained quite clean, and he found that the hardening of the black tube was so great that twice as many volts had to be applied to it to start a current, as in the case of the clear tube. His conclusion was that the mere presence of blackness on the inner surface of the tube increased its resistance, quite irrespective of the degree of vacuum. In other words, the hardening and depreciated utility of the tube had nothing to do with the vacuum, but was due to the presence of a conducting film upon the glass.

The theory involved in this last result was partly confirmed by Mr. Mackenzie Davidson, who said in the course of the subsequent discussion that he had had a similar experience.

Mr. W. Duddell thought it possible that the high resistance of the coating allowed the cathode to come nearer to the anode, so that a portion of the anode projected into the cathode dark space, thereby increasing enormously the resistance of the tube.

The Management of Central Stations.

On March 4th the Civil and Mechanical Engineers' Society met for the purpose of hearing a paper by Mr. R. Borlase Matthews on "Some Commercial Aspects of the Management of Central Electricity Supply Stations." The author classified the modern methods of increasing the sales of electrical energy at profitable prices, under the heads of good service, canvassing and advertising. Good service was something more than keeping the voltage steady and maintaining an uninterruped supply; it should include advice to consumers, maintenance of their lamps, and simple, easily-understood methods of charging. The author proposed a novel method of charging that would allow, in the case of residences, of the use of electrical energy for lighting, heating, cooking and power on one circuit with one meter. The metered energy would be charged for at, say, 1d. per unit (based on the running costs of the station), and, in addition, there would be a lump sum charge (representing interest and standing charges on the plant), the latter figure to be settled in the case of each consumer in accordance with the total area of rooms to be illuminated. This was for all practical purposes a lump sum lighting con-

tract, with a meter to check the consumer if he should take an unfair advantage of his contract by using his lamps when not required. In dealing with the necessity for canvassers if electricity supply undertakings were to be developed to their utmost extent, the author pointed out how important it was that these men should be properly trained, so that they might attain the best results; the way should be prepared for a canvasser by some form of educational advertising. Localised electrical bulletins were advocated by the author, and a publicity literature scheme was outlined representing 50,480 appeals to a group of areas having a gross population of 44,000, at a cost of £80.

Mr. W. N. Twelvetrees, the Chairman, said that his experience was that the commercial management of electricity supply undertakings was, as a rule, unbusinesslike in the extreme, not at all approaching the conduct of gas works.

Mr. Leonard Andrews stated that he was in general agreement with the paper. As regarded rates of charging, he could not see how the proposed system was to be applied to the complicated case where a man lived in a house over his shop and used electric power as well. Instead of basing the rate on the number of square feet to be illuminated, he thought it would be preferable to take into account the cubic contents of the house under consideration. In his opinion canvassers were a nuisance to prospective consumers, and should be employed rather to ensure that existing consumers were satisfied, as a satisfied consumer was the best canvasser.

Mr. Davies (St. Marylebone Publicity Department) said that, though canvassers might be a nuisance, the central station that wished to go ahead was bound to employ them, for they brought in many who would otherwise not have become consumers. The proposed rates of charging would not be easily applicable to town houses, where the tenants were so often absent on a long holiday.

Mr. C. A. Ablett urged the need of canvassers who knew their business, had something to say and said it, and could reply to ordinary queries with authority, without referring to their chiefs; otherwise, they were worse than useless, only annoying prospective customers.

Further discussion followed, and in his reply, the author pointed out that the system of charging that he had suggested was not so complicated as it looked. Moreover, in all probability an alternative flat rate would always be offered to consumers.

Physical Society.

At the meeting held on January 22nd, 1909, a paper on the "Effective Resistance and Inductance of a Concentric Main, and Methods of Computing the Ber and Bei and Allied Functions," was read by Dr. Alexander Russell. Simple formulæ for calculating the functions used were obtained and employed to correct errors in the tables given by Kelvin and also by Mascart and Joubert. The following simple formula for the effective resistance R, per centimetre length, of the inner conductor of a concentric main for high-frequency currents was obtained:—

$$R = (\rho\, m/2\pi a)\,(0{\cdot}7071 + 1/2ma + 0{\cdot}265/m^2a^2 - 0\,3\backslash/m^4a^4),$$

where ρ is the volume resistivity of the conductor, a its radius, $m^2 = 8\,\pi^2\mu\, f/\rho$, μ the permeability of the conductor, and f the frequency of the alternating current. This formula may be used in wireless telegraphy for calculating the resistance of a conductor when other conductors carrying high-frequency currents are not too close. For values of $m\,a$ greater than 6 the maximum inaccuracy of the formula is less than 1 in 10,000.

In obtaining the solution, exact formulæ are obtained for the density of the current at all points on the inner and outer conductors.

In the course of the discussion which followed, Mr. B. S. Cohen said that a knowledge of the variations with frequency of effective resistance and inductance of copper conductors was of considerable importance in connection with telephonic transmission. The heaviest gauge of conductors met with in general telephonic practice was 2·85 mm. in diameter in the case of cables, and these conductors were separated by about 2·5 mm. of combined paper and air dielectric and twisted together with a lay of about 15 cm.

In the case of overhead open wires, the largest conductor in general use was 4 mm. in diameter, although in a number of cases a 5·69-mm. conductor had been used. The mean axial distance apart of these conductors was about 35 cm. as they were rotated in sets of four in a foot square.

Applying Lord Rayleigh's formula for effective resistance in these cases, they got, for a frequency of 1,500 cycles, an increase of 1 per cent. in effective resistance over steady current resistance in the case of the 2·85 mm. cable wire. A frequency of 1,500 cycles could quite safely be taken as the maximum frequency which was of any importance in speech articulation. The increase with the 5·69 mm. open wire at this frequency was 12 per cent., and with the 4 mm. wire 3·55 per cent.

The author, in reply to Mr. Duddell, stated that in his opinion stranding and insulating the strands of the wires used in wireless telegraphy would not diminish the skin effect if the strands were parallel to the axis of the wire. It would probably increase it. Silver-plating the wires would be beneficial. Mr. Campbell's experimental results showed that it was possible to make coils of low time constant so that frequencies even as high as a million had little effect on their inductance. With ordinary laboratory coils a frequency of 10,000 would alter their inductance 2 or 3 per cent. Dr. Eccles rightly laid stress on the importance of keeping the surface of the wires used in wireless telegraphy in good condition, and careful lacquering would be very beneficial.

A paper entitled "Note on the Luminous Efficiency of a Black Body," was read by Dr. C. V. Drysdale. The comparison of the luminous energy with the intensity of light radiation led to a mechanical equivalent of light of about ·075 watt per candle, which was a fairly probable figure. The results showed the enormous extent to which the luminous efficiency was dependent upon the temperature, and how extremely low it was at ordinary temperatures. At 1,500° C. the efficiency was only of the order of 1 per cent., or less, while at 2,000° C. it was about 3 per cent. The highest efficiency was obtained at a temperature of about 6,500° C., and was then only between 40 and 50 per cent. This strongly pointed to the necessity for working in the direction of selective radiation or luminescence.

A paper on "The Use of the Potentiometer on Alternate Current Circuits" was read by Dr. C. V. Drysdale. The great difficulty in A.C. measurement lies in the shortness of the range of the instruments available, and there is, therefore, a great need for some instrument which, like the direct potentiometer, should be capable of measuring P.Ds. and currents of any range with accuracy. The author's recent experiments with a phase-shifting transformer led him to attempt to use it with a potentiometer, and the measurements were then made in the same manner as with an ordinary direct-current potentiometer, except that a vibration galvanometer or telephone was substituted for an ordinary galvanometer. By interposing an ammeter on the dynamometer principle in the main circuit of a potentiometer, and deriving the current from the secondary of a phase-shifting transformer, it was possible to check the instrument with direct current against the standard cell in the ordinary way, and then to reproduce the same current in the potentiometer circuit and to bring it into coincidence of phase with the P.D. to be measured.

Experiments made with this device had been found to give very good agreement with a Kelvin balance. An alternating P.D. of ·1 volt could be measured to an accuracy of ·2 per cent. or closer. The author had also designed a universal potentiometer on this principle, which served both for D.C. and A.C. measurements.

At the meeting held on February 26th, a paper "On the Self-Demagnetising Factor of Bar Magnets," by Prof. S. P. Thompson, F.R.S., and Mr. E. W. Moss, was read by Prof. Thompson. It was shown that, in general, for every bar magnet there is a self-demagnetising action, the value of which at the middle of the bar depends, for a given intensity of magnetisation, on the length of the bar relatively to its cross-section, on the permeability of its parts, and on the distribution of its surface magnetism. Experiments were made on the values of the self-demagnetising factor for bar magnets of circular section, and for bar magnets of rectangular cross-section, and it was found that for equal values of the dimension ratio the factor for bars having a sectional ratio of 2 : 1 was about 93 per cent. of that for bars of square section; while for flat bars, having a sectional ratio of 10 : 1, the value of the self-demagnetising factor went down to about 75 per cent. of that for bars of square section.

The Secretary read a letter from Dr. A. Russell, stating that it could be shown that if the length of the axis of a helical current was greater than six times its diameter, the magnetic flux entering or leaving the end planes was within about 1 per cent. of half the total flux through the central plane.

Mr. C. R. Darling exhibited a simple form of thermo-electric pyrometer for students' use, a combined metre-bridge and potentiometer, with new tapping-key device, for pyrometric and general laboratory work, and a new form of carbon-plate rheostat, suitable for the control of small electric furnaces.

The Electrification of Railways.

By F. W. Carter, M.A. (Member).

(*Abstract of paper read before the* Rugby Engineering Society, *February 18th*, 1909.)

Whatever system of electrification is adopted a very large outlay has to be faced, and no case for electrification can be made out unless an increase in net receipts can be secured more than sufficient to pay interest on the extra capital involved. This increase may be brought about either by decreasing the working expenses for the same service, by so modifying the service as to bring in greater revenue, or by a combination of these.

Both experience and calculation agree in indicating that, in this country, where coal is cheap and little water-power is available, the decrease in working expenses alone will not in general justify electrification. In fact, it is only in certain classes of service that any decrease can be expected.

The question of the movement of trains is, in the main, a dynamical one, there being nothing in the nature of electricity to enable it to do more work than other agents, with a given expenditure of energy.

The higher the rate of acceleration the lower is the energy consumption; the inequality, however, becomes less the greater the distance between stops. Since however, in general, more driving machinery is necessary the higher the rate of acceleration—whereby the weight of the train is increased—the advantage in favour of a high rate of acceleration is reduced, since the energy consumption per train-mile is proportional to the weight of the train.

It is considerations of this nature which render the single-phase system unsuitable for urban service. We, in this country, demand a fairly high schedule speed in such service, and a high rate of acceleration is a necessity. It can only be obtained at a ruinous cost on the single-phase system.

Had the Metropolitan District Railway adopted the single-phase

system, the trains would have been at least 30 per cent. heavier their energy consumption being increased in like proportion. It is probable that a half of the expense of electrification on this railway is represented by train equipments, and this item would have been more than doubled had the single-phase system been adopted.

Apart from the greater capital outlay and energy consumption incident to the single-phase system as applied to urban and suburban service, the maintenance of the train equipments would be much more expensive. Mr. W. S. Murray, the electrical engineer of the New York, Newhaven and Hartford Railroad, than whom no one has had greater experience of single-phase operation, gives the figure of 1·5d. per mile for the maintenance of the 1,000-H.P. locomotives used on this line—apparently as a figure that it is hoped to attain when preliminary troubles have all been surmounted. This may be compared with ·85d. per mile for the maintenance of the 2,200-H.P. New York Central and Hudson River Railroad locomotives (average for 25,000 miles service) and ·24d. per mile for the Buffalo and Lockport locomotives, which carry a 600-H.P. equipment (average for 132,000 miles service). It would appear from this that the maintenance of single-phase equipments is quite three times as expensive as that of continuous-current equipments of equal power.

The determining factors are, therefore, all in favour of the continuous-current system for speedy and frequent urban or suburban service. Its advantages over other systems are so great for this class of service that, if line conductors beside the track could not be tolerated, it would be preferable to hang the third rail over the track, suspension bridge-wise, rather than adopt any other system.

The true place of the single-phase system is in somewhat infrequent interurban service. In such service, the rate of acceleration is of small consequence, the maximum speed being the determining factor in meeting the schedule. The saving in sub-station machinery then more than makes up for the extra cost of train equipments, and the higher efficiency of distribution for the greater energy consumption of the train. The overhead line conductors need not be more expensive to install than a third rail; the maintenance of the overhead conductors will always be greater than that of a third rail, but this expense will hardly be a determining factor so long as trains are comparatively infrequent.

For long-distance high-speed service, the train resistance is high, and the greater part of the energy is expended against this. A high rate of acceleration is not necessary, but a high continuous capacity is required of the driving equipment. For such service, a polyphase system, using induction motors, offers many advantages, but has the serious disadvantage of requiring at least two overhead line conductors.

There are no examples of electrical operation of high-speed long-distance service as we understand it.

Electrical operation, as compared with steam, shows to greatest advantage in urban and suburban service. Here a high rate of acceleration can be used, and a schedule speed quite impracticable in steam operation maintained. Moreover, a more frequent service can be given without a proportionate increase in expense, whilst, in times of light traffic, small trains only need be run.

In a well-considered scheme the operating costs are considerably reduced, and this saving alone should more than provide for interest on the extra capital.

In inter-urban service with several miles between stops, electrical operation does not offer the advantage of practically permitting a schedule speed in excess of that possible by other means, but it still offers some advantages, in that small and frequent trains can be run with economy, thus creating traffic by improving the service.

In the case of long-distance express service, the advantages of running frequent small trains diminish, since, when most of the energy is expended against wind resistance, the expenditure per coach is considerably greater for small than for large trains. It is only where the traffic is so dense that frequent large trains can be employed, that any appreciable advantage in electrification can be shown in this class of service.

The above remarks are intended to apply to the electrification. In the case of entirely new railways, constructed to suit electrical operation, the total capital outlay would be less than the electrification of existing lines.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

The Simpson Coil Tester.

Mr. A. G. Brown, of 23, King Street West, Manchester, is introducing an instrument under this title for detecting internal short circuits in any coil. In a circular describing the instrument, it is mentioned that systematic examination and repair of the insulation of tramway motor field coils has resulted in a saving of nearly £1,000 per month for energy, in a large city not named, but which we take to be Manchester. The instrument embodies the principle of the Hughes magnetic balance; in use the terminals are connected to any D.C. or A.C. lighting circuit, and the coil to be tested is placed on a bare board, through which a core projects. The presence of a short circuit is indicated by a loud musical note in a telephone receiver, the loudness being roughly proportional to the number of turns shorted. No connections at all are made to the coil under test, which is not prepared in any way; the tests can therefore be made rapidly by an unskilled person.

The instrument is useful not only in the repair shop, but also in the factory, and it is made in portable form for outdoor work, with a storage battery.

Open-Type Wiring.

Messrs. Veritys, Ltd., have brought to our notice a simple system of open-type wiring which they have recently introduced. Our illustration is almost self-explanatory; it shows the two-part porcelain cleats fixed to rafter or ceiling by one screw, and gripping braided positive and negative cables.

The central circular porcelains form a ceiling rose to support the pendant flexible; the latter has the inner ends bared and wrapped round the strands of the main cables on either side, the main cables also being bared for about one inch of their length for this purpose. The pendant porcelains are fixed by two screws, and it is claimed that an excellent contact is obtained at the joints, and that the construction is exceptionally strong.

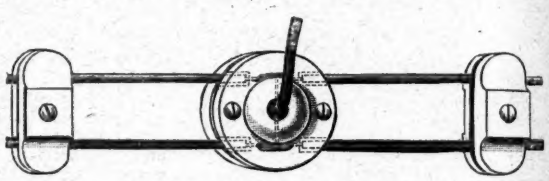


Fig. 1.—Open Wiring System.

This class of wiring is, of course, of a rough, inexpensive character, and we can imagine that there are many situations where it would suffice for all practical purposes, and give results as good as those of many of the costlier systems at present adopted.

In admittedly damp situations, dabs of bitumen placed on the bared cable joints in the ceiling rose would, without appreciably adding to the cost, probably ensure satisfactory insulation if any trouble were anticipated from deposited moisture.

There is an undoubted demand for cheaper wiring at the present day, and Messrs Verity inform us that the above system has found employment on some large installations, which were readily approved by the insurance companies.

A Protective Shield for Linemen.

The *Electrical World* gives particulars of a protective shield for the use of linemen, which has recently been placed on the market by the Linemen Protector Co., 201, Whitney Building, Detroit, Mich., and is composed of pure Para rubber. The main portion of the shield is made of three-eighths-inch rubber, tapering down at the extremities which are least required for insulating value to

Fig. 2.—Linemen's Protective Shield for Live High-Tension Wires.

three-sixteenths of an inch. In order to give the shield sufficient rigidity and to make it tend to hold its original shape and fit closely over the insulators and wires, heavy strips of raw canvas are criss-crossed, and this method of laying up the canvas strips also lessens the possibility of puncture from a tool or from a lineman's spur.

In order that the shield may be held firmly to the wire a split ebonite ring having an inclined half-inch gap, so that it may slip easily over the wire, is fitted over each of the small ends.

The shield when in use is placed upon the high-pressure wire, lapping over the insulator and extending for a foot or so on either side of it, so as to prevent accidental contact with the live wire.

The shield is recommended by the manufacturer for use on all live circuits not exceeding 7,500 volts; it is in use, however, on circuits as high as 10,000 volts. In wet weather it is not desirable, perhaps, to use the shield on circuits carrying voltages higher than 4,000.

While in this country high and low-pressure wires are not usually placed near one another on a pole, our Colonial readers may have to encounter less healthy conditions, and may be pleased to hear of this device.

Reavell Oil Engines.

Following the prevalent fashion, Messrs. Reavell & Co., Ltd., of Ipswich, have recently placed on the market a series of small self-contained electric lighting sets, consisting of vertical oil engines direct coupled to dynamos. These sets are supplied in 3½, 5, 7½, 10 and 15-B.H.P. sizes, and have net weights, exclusive of bedplates, varying from 320 to 950 lb. Messrs. Reavell have utilised their considerable experience in manufacturing high-speed steam engines, to produce a substantial reliable machine suited to continuous service.

The engines are of the four-cycle type, arranged normally for working with common paraffin, but easily adaptable for other fuels of a similar character.

Some of the features embodied are: Nickel steel valves, governors of the crankshaft centrifugal type, splash lubrication, thermo-siphon system of water cooling, high-tension coil and battery ignition; the engines are started up on petrol. Various fittings and spares are provided with each engine, and the complete plants (including water and fuel tanks, piping, &c.) can be supplied if desired.

As regards economy, the smallest size (3½ B.H.P.) shows a consumption of ·825 to ·85 of a pint of common paraffin per B.H.P.-hour.

Electric Lifting Magnets.

Electric lifting magnets operated in conjunction with travelling cranes or transporters save considerable time in steel works and the like for handling pig iron, rails, girders, &c. They eliminate the time involved for adjusting slings, chains, &c, as the whole proceeding is under the control of the crane driver.

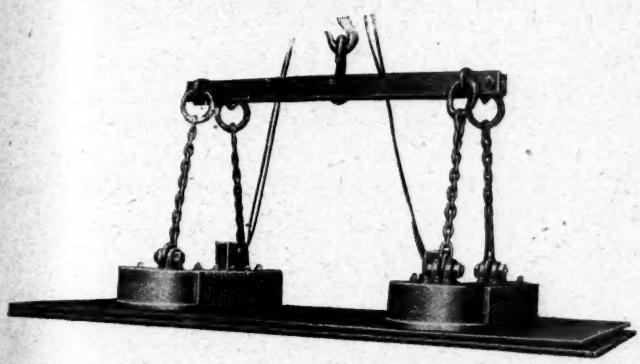


Fig. 3.—Kramos Plate Lifting Magnet.

They are also very useful where material has to be handled at a high temperature, such as castings, &c., which are too hot to be touched by hand.

The magnets illustrated herewith were made by Messrs. Kramos, Ltd., of Bath, who specialise in the construction of all types of electromagnets.

They are of strong construction, being entirely ironclad, and to facilitate the radiation of heat the larger sizes are provided with corrugated casings, and a central ventilating aperture is provided.

The leads are of steel-armoured cable, brought out through a gland in the case, and connected to the operating switch in the driver's cage. A cable drum is provided for winding up the slack cable when the crane is lifting. In the largest sizes a discharge resistance is provided, which prevents injury to the coils through the high inductance.

The cost of power for working these magnets is an almost negligible item. We are informed that an elliptical magnet, 42 in. × 14 in. in size, consuming 440 watts, will lift 10 cwt. of steel plate, 12 cwt. of steel strips, 8 cwt. of pig iron, or 2½ tons of solid steel under favourable conditions. With a 16 in. dia. round

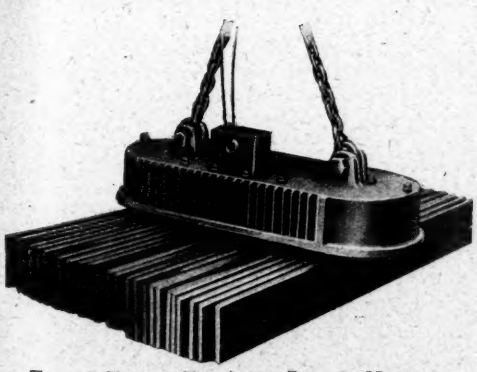


Fig. 4.—Kramos Elliptical Lifting Magnet.

magnet, a man can handle 275 tons of steel plate per day, at an average working cost of one penny per hour for the magnet. With a 25-in. round magnet 102,350 lb. of pig-iron was unloaded from a railway wagon in about two hours, the average lift being 785 lb.; this necessitated 139 trips of the crane, the current being on for one hour 18 minutes, and off for 50 minutes. The energy consumption was 6,600 watts for 1¼ hours, or a total of about 8.25 kw.-hours. At 1½d. per unit the cost of unloading over 50 tons of pig-iron is 1s. for electricity, and all the operations are performed by the crane driver without assistance from below.

Under these conditions it is estimated that the initial cost of a lifting magnet can be covered by the labour saved in a very short time.

Automatic Switch for Staircase Lighting.

In the accompanying figure we illustrate a device that is being supplied by the Electrical Co., Ltd., of Charing Cross Road, W.C. It is an automatic switch (1909 model) for continuous and alternating current circuits, the prices being given in a leaflet just issued by the company. It is intended for use for halls and corridors in mansions, flats, large offices, hotels, &c, in order to prevent waste of light after usual hours; and it may be operated either by a door switch or by one or more push buttons. A change-over switch is usually provided to allow of the lights being continuously on up to, say, 10 p.m. After that time the switch is put on to the "night" position, *i.e.*, all lights are out. On opening the door, or by pressing the button, the lights are switched on and remain burning for about 1½ minutes, after which they auto-

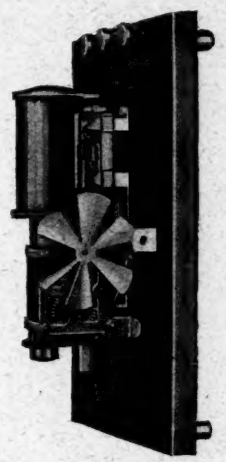


Fig 5.—Automatic Staircase Switch.

matically switch off. A further pressing of the button causes the switch to repeat its action, but the period of lighting can be prolonged if the button is re-pressed shortly before the device switches off. As a push button may be used on each floor or at different positions along the corridor, the device may be used when either going up stairs or coming down, or at any point in the house.

Simplex Lamps and Fittings.

In the third edition of their electric lamp catalogue just to hand, Messrs. Simplex Conduits, Ltd., show in admirable style, metallic-filament lamps in bulbs of various shapes. The firm are now supplying lamps for all voltages from 25 to 260, and from 16 to 200 c.p. They are also supplying 40-c.p. 200—240-volt lamps, but as they are of an extremely fragile nature, they are not being stocked; all other lamps listed are stocked at the various branches. In addition a number of shades and fittings for the above lamps

Fig. 6.—Ceiling Fitting for Metal-Filament Lamps.

are also shown, as well as Simplex auto-transformers. Prices are set forth. Many fittings specially designed for metal-filament lamps are open to inspection at the Simplex showrooms, a wide range of designs and prices being covered. We illustrate a special ceiling fitting with cut glass bowl; this fitting is made to take four 50-c.p. high-voltage metal-filament lamps, and is particularly intended for the lighting of large halls, hotels, &c.

ZZ Lamps.—The Zirkon-Glühlampenwerk Dr. Hollefreund & Co., of Berlin, is advertising an efficiency for its metallic-filament lamp of 0·7 watt per Hefner candle—say 0·76 watt per British candle—showing an economy of 30 per cent. over other makes, and 80 per cent. as compared with carbon-filament lamps. It would be interesting to know, on good authority, what the life of these lamps is, and what voltages and candle-powers they can be made for.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

CANADA.

(*Continued from page* 455.)

In order to facilitate the Customs entry of goods imported from all countries into Canada, shippers are advised that the way-bills should show full information regarding name and address of consignee, marks and numbers of packages, and description of packages. Where goods are shipped in bulk, the number of pieces, bundles, bushels, &c., is required. In the case of agricultural implements, the number and description of each class of implement is to be stated, except when packed in cases, crates or other containers, when the number and description of such packages should be stated. It is very important that way-bills and bills of lading show the required information, in order that the "carrier" may furnish the reports required to be made at the Custom House and prepare manifests for transporting the goods in bond.

The following form of invoice has been approved by the Canadian Customs for goods sold by exporter prior to shipment:—

(Place and date) .....

Invoice of purchased
by of
from of
to be shipped per

Marks and numbers on packages.	Quantities and description of goods.	Fair market value as sold for home consumption.	Selling price to the purchaser in Canada.
			Amount.

Whenever any duty *ad valorem* is imposed on any goods imported into Canada, the value for duty is the fair market value thereof, when sold for home consumption, in the principal markets of the country whence and at the time when the same were exported directly to Canada. Such market value is the fair market value of such goods in the usual and ordinary commercial acceptation of the term, at the usual and ordinary credit, and not the cash value of such goods, except in cases in which the article imported is, by universal usage, considered and known to be a cash article, and so *bona fide* paid for in all transactions in relation to such article; and all invoices representing cash values, except in the special cases herein referred to, are subject to such additions as to the collector or appraiser of the port at which they are presented appear just and reasonable, to bring up the amount to the true and fair market value, as required.

Drain pipes, sewer pipes, and earthenware fittings therefor	25% ad val.
Earthenware and stoneware, not otherwise mentioned in the tariff	20% ad val.
Portland cement, per 100 lb.	8 cents.
Asbestos, in any form other than crude	15% ad val.
Plumbago, not ground or otherwise manufactured ...	5% ad val.
Plumbago, ground and manufactures thereof	15% ad val.
Carbons, over 6 in. in circumference	free
Electric light carbons and carbon points of all kinds ...	22½% ad val.
Incandescent lamp bulbs and glass tubing for use in the manufacture of incandescent lamps	5% ad val.
Lamp chimneys, glass shades or globes	20% ad val.

(*To be continued.*)

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

4,928. "Improvements in or relating to electrically-driven rotary pumps." A. B. Mallinson. March 1st.

4,957. "Improvements in the method of and apparatus for armouring cables or the like with metal tubing." E. Witzemann. March 1st.

4,989. "Improvements in and relating to cases or boxes for accumulators or secondary batteries." T. Norton. March 1st.

4,991. "Improvements in the construction of armatures for magneto machines." M. A. Codd. March 1st.

4,997. "Improved safety device for the dissipation of excess voltage in electrical systems." G. Giles. (Date applied for under Sec. 91 of the Act, May 29th, 1908, being date of application in Switzerland.) March 1st. (Complete.)

5,018. "Improvements in trolleys or rotary collectors for the electric cables." J. J. Bennett, L. B. Estes and R. Evans. March 1st. (Complete.)

5,040. "Improvements in electric indicators." A. Whalley. March 2nd.

5,047. "Improvements in magneto-electric machines, more especially intended for igniting the explosive mixture in internal combustion engines." F. I. Hoffman. March 2nd.

5,061. "Improvements in and relating to the method of and apparatus for distributing electrical energy." A. W. Somers and R. J. Crowley. March 2nd.

5,062. "Improvements in and relating to an improved electrical storage battery." A. W. Somers and R. J. Crowley. March 2nd.

5,070. "Improvements relating to electric apparatus for street and other lighting. W. G. Potter. March 2nd.

5,081. "Improvements relating to means for rectifying electric currents." T. J. Murphy. March 2nd. (Complete.)

5,087. "Apparatus for electro-plating." R. E. Phillips. (Meaker & Co., United States.) March 2nd. (Complete.)

5,096. "Improvements in electric illuminating and switching devices for use with taximeters on public vehicles and the like." S. Alley. March 2nd.

5,114. "Secret telephone transmitters." L. Heyworth. March 2nd. (Complete.)

5,119. "Improvements in motor-generator sets." British Thomson-Houston Co., Ltd. March 2nd. (Complete.)

5,131. "Magnetic instructor." P. R. Herbert. March 3rd.

5,145. "Improved electrical relay." M. S. Conner. March 3rd.

5,168. "Improvements in electrical regenerative control apparatus and systems." Crompton & Co., Ltd., J. C. Macfarlane and H. Burge. March 3rd. (Complete.)

5,209. "Improvements in motor-generator sets." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) March 3rd. (Complete.)

5,210. "Improvements in and relating to ignition devices for internal combustion engines." B. Hopps. March 3rd.

5,223. "Safety shut-off appliance for electrical controllers. F. W. Lacey. March 4th.

5,235. "Improvements in trolley heads as used on electric vehicles. H. Dudgeon and H. Cross. March 4th.

5,238. "Improvements in means and apparatus for controlling magnetic movements." A. E. Vickery. March 4th.

5,249. "Improvements in or relating to trolley-heads or current collectors for electric traction." E. M. Munro and Railless Electric Traction Co., Ltd. March 4th.

5,279. "Improvements in or relating to electrical signalling apparatus, particularly applicable to fire and burglar alarms and the like." G. L. Smith. March 4th.

5,280. "Improvements in and relating to multiple switch starters." H. W. Lake. (Cutler-Hammer Manufacturing Co., United States.) March 4th. (Complete.)

5,302. "Improvements in electric terminals." G. E. Tate. March 4th.

5,318. "Improvements in and relating to the control of dynamo-electric machines." Allgemeine Elektricitats Ges. (Date applied for under Sec. 91 of the Act March 4th, 1908, being date of application in Germany.) March 4th. (Complete.)

5,337. "Combination electric bell-push and fire alarm." R. Hurst. March 5th.

5,360. "Improvements in or relating to the production of magnets from cast-iron for use in electric magnetic machines." F. Burns. March 5th.

5,413. "Improvements in apparatus for measuring alternating electric currents." S. Guggengeimer and P. F. C. Gossen. March 5th. (Complete.)

5,418. "Improvements in devices for controlling electric circuits." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) March 5th.

5,426. "Improvements in and connected with loud-speaking telephones." H. Oppenheimer. (Akt. Ges. Mix & Genest, Germany.) March 6th.

5,451. "Improvements for orchestrions, electric pianos, piano-players and like instruments." G. Probst. March 6th.

5,459. "Improved maximum current indicator for electricity." T. McClelland. March 6th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1908.

Telephone Apparatus. F. H. Stolz and C. H. Viggars. 13,875. June 30th.

Control of Electric Motors. British Thomson-Houston Co. (General Electric Co., United States.) 16,621. August 6th.

Current Collectors and Control Systems. H. L. Beach. 19,054. September 26th. (Date applied for under International Convention, September 26th, 1907.)

Arrangements for Securing the End Connections of Rotors of Dynamo-Electric Machines. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Ges., Germany.) 19,720. September 19th.

Controlling Devices for Electric Motors. Hallock. 23,602. November 4th. (Date applied for under International Convention, November 8th, 1907.)

Electric Burglar Alarms. B. Trautmann. 24,013. November 9th.

Apparatus for Transforming Electric Currents, Applicable for Producing Ringing Currents in Telephone Systems. F. Falkenthal. 2,824. February 7th. (Rights under Sec. 91 of Patents, &c., Act, 1907, not granted.)

Dynamo-Electric Machines. J. C. Amphlett and H. P. Amphlett. 2,883. February 8th.

Electrical Signal Apparatus with Wireless Transmission. A. Mund. 3,154. February 12th.

Cathodes for Use in the Electro-deposition of Iron and other Metals. S. O. Cowper-Coles. 3,160. February 12th.

Electrically-Heated Vulcanising Apparatus for Tire Tubes and Covers. W. H. Welch and Harvey, Frost & Co. 3,250. February 13th.

Electrical Power Transmission Systems. British Thomson-Houston Co., T. E. Robertson and F. Holden. 3,284. February 13th.

Incandescent Electric Lamps. J. W. Howell. 3,388. February 14th. (Date applied for under International Convention, August 7th, 1907.)

Electrical Apparatus for Charging Accumulators. P. Marchal. 3,494. February 15th.

Prepayment Mechanism for Electric Meters and the like. J. A. Robinson. 3,646. February 18th.

Electrical Arrangement for Starting the Siphons of Water Closet Cisterns. C. J. de Haas. 3,710. February 18th.

Telephone Systems. C. F. Bradburn. 4,246. February 25th.

Choking Coils. R. K. Morcom and D. K. Morris. 4,361. February 26th.

Printing and Sight Reading Telegraph Apparatus. E. W. Beech. 5,042. March 5th.

Automatic Electric Control for Fluid Compressing Pumps for Working Mechanisms at Variable Capacities. E. C. R. Marks. (Societa Anonima Italiana Gio Ansaldo Armstrong & Co.) 6,461. March 23rd.

Electromagnetic Circuit-Breakers for Use in Connection with Electric Motor Controllers. Electric & Ordnance Accessories Co., R. F. Hall and M. Muller. 7,382. April 3rd.

Arrangement of Driving and Breaking Gear for Overhead Electric Cranes. A. Jack. 8,467. April 16th.